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WM. R. STANSBURY

IN THE

Supreme Court of the United States.

NO. 185.

OCTOBER TERM, 1923.

THE JOHN E. THROPP'S SONS COMPANY,

Petitioner.

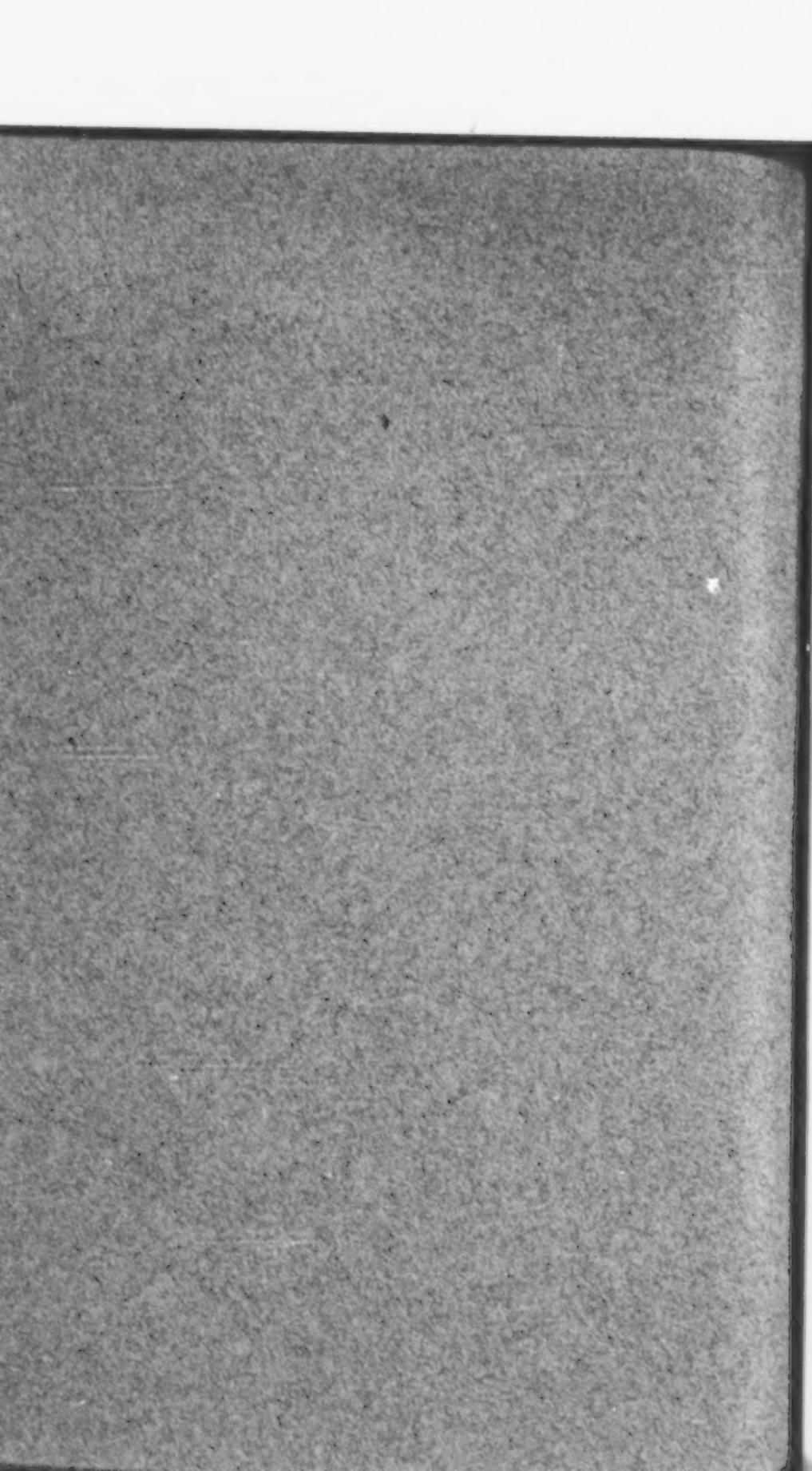
FRANK A. SEIBERLING

Respondent.

BRIEF FOR RESPONDENT.

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THE JOHN E. THROPP'S SONS COMPANY,
Petitioner,
vs.
FRANK A. SEIBERLING,
Respondent. } No. 185.

BRIEF FOR RESPONDENT.

The patent in suit in this case, namely, that to Will C. State, No. 941,962, granted November 30, 1909, for Pneumatic Tire Shoe Manufacturing Machine, was held invalid by the Circuit Court of Appeals for the Sixth Circuit (*The Firestone Tire & Rubber Co. v. Frank A. Seiberling*, 257 Fed. 74), and, subsequently, after the filing of a statutory disclaimer limiting it, was held valid and infringed by the Circuit Court of Appeals for the Third Circuit (284 Fed. 746). It is the case last referred to that is now before this Court, having been brought here by certiorari.*

There are four outstanding questions in the case, viz:

1. Did State make an invention that was patentable over the prior art?
2. Does the State patent, as limited by the disclaimer, cover that invention?

* We shall in this brief, for the sake of uniformity, adopt petitioner's practice of referring to the respondent as plaintiff and the petitioner as defendant.

3. Has the defendant infringed the patent?
4. Is the disclaimer valid?

To these questions, in turn, we will address ourselves.

Decision of the Court of Appeals for the Sixth Circuit.

Defendant relies largely upon the opinion of the Court of Appeals for the Sixth Circuit in support of its contentions. In this connection, however, it should be borne in mind that the present record, and particularly in view of the statutory disclaimer, is vastly different from that in the *Firestone* case. The Court of Appeals below found this to be the fact and stated as follows:

"As shown in its opinion printed in the margin, the Court below conceived the case was substantially the same as that decided by the Circuit Court of Appeals of the Sixth Circuit, reported at 257 Fed. Rep., and without itself entering into a discussion of the issues here involved, it in effect followed that case. As in our view the record presented in this case is substantially different from that before the Circuit Court of Appeals in the case cited, we are justified in placing of record a full statement of the issues here involved and our reasons for reversing the decree entered below."

Rather than attempt to give a specific statement of the altered situation here, the matter will be dealt with in the detailed discussion under the appropriate headings.

Prior Tires.

For the information of the Court and in order that it may obtain a proper comprehension of State's achievement, it is believed desirable to make this brief historical rather than contentious down to the point when he produced his machine and obtained a patent for it. It is not until then that real controversy arises. The facts thus set forth are substantially undisputed or else based on the admission of defendant's witnesses. The earlier history of tires is given by Mr. Browne, plaintiff's expert.

When the automobile was introduced, there were no tires which were capable of general use thereon. There had been two types of rubber tires. The first of these were solid rubber tires, such as were used on ordinary carriages. There were also flexible pneumatic tires, such as were used upon light vehicles like bicycles and racing sulkies. These latter were generally known as "bicycle" tires, and being light as well as flexible, they were readily made by a number of processes (Vol. I, p. 430, Q. 2). The most conspicuous characteristic of the bicycle tire was its extreme flexibility, which rendered it incompetent for severe use, as it lacked sufficient stiffness or rigidity to enable it to retain its shape without reinforcement.

Automobile Tires.

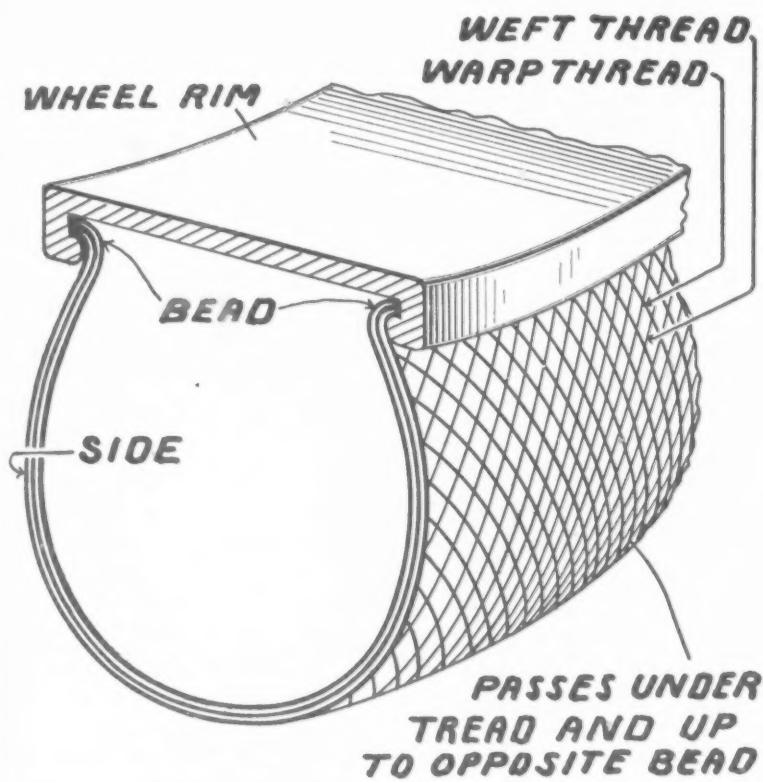
Automobile tires must be large, stiff and massive, and no one of the usual simple processes of making bicycle tires was adequate to produce them. With automobiles, very great weights must be carried, running into tons, and as compared with bicycles much greater speeds have to be endured, up to fifty or more miles an hour. Accordingly, the tires must be strong enough to sustain the lateral twisting forces such as arise in turning a corner

under speed. They must be able to withstand the effects of the heavy pounding oscillations of the engine which produce violent strains on the tire in one circumferential direction, and they must also be able to resist powerful braking operations which produce circumferential strains in the opposite direction. That is to say, automobile tires have to sustain severe loads and strains in every varying combinations and in all directions.

The carcass of the automobile tire is made up of superimposed layers of strong fabric. In the completed tire this carcass is concealed and covered by various layers of rubber or rubber compound. This rubber covering is chiefly protective in its purpose and has little capacity in resisting strains or loads. The carcass affords the necessary strength and resistance, it being in the nature of a corded skeleton contained beneath the surface layer of rubber. It is this latter element which is alone involved in this action and which is stated in the patent in suit to be constructed by the machine disclosed therein (Vol. I, p. 432, Q. 5).

It is not to be understood that the automobile tire is without flexibility, but its vital characteristic is its stiffness, since it is substantially permanent in structure and shape, both when in use and when detached. It is flexible only in the sense that it may yield under strain somewhat in the same sense as a suspension bridge, but otherwise it is stiff and comparatively rigid so as to be adequate to sustain the load carried by it and to transmit the driving force. The purpose of the carcass is to furnish lines of strong cords in such directions as to take all loads as uniformly divided between them as practicable. It is for this reason that it has been likened to the suspension bridge, wherein there is a vast number of tie wires extending in such directions and with such anchorages as to effect the same result.

The relation of the carcass to the wheel rim of the automobile is illustrated in the accompanying cut.



It shows a perspective view of a small portion of the rim and a section of a tire carcass connected therewith. It will be seen that each cord or thread starts at one side of the tire from an anchorage at the lower edge or bead (that being the portion which is in contact with the wheel rim), and that it runs at an angle of about 45° across the upper portion or tread of the tire, and thence angularly to an anchorage at the opposite bead. This anchorage of the cords at the two beads, and the paths of the

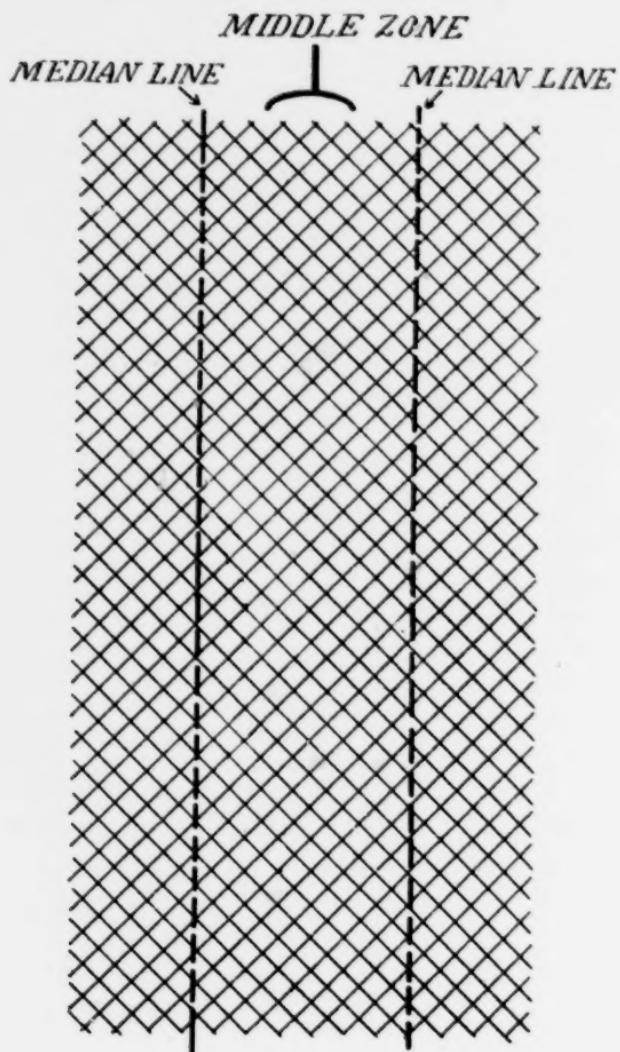
cords in diagonal lines from one bead across the tread to the other bead, is of vital importance, since the power of the engine transmitted to the wheel rims imparts motion first to the beads in contact therewith and then through the cords to the tread, which, by its contact with the ground, drives the car forward.

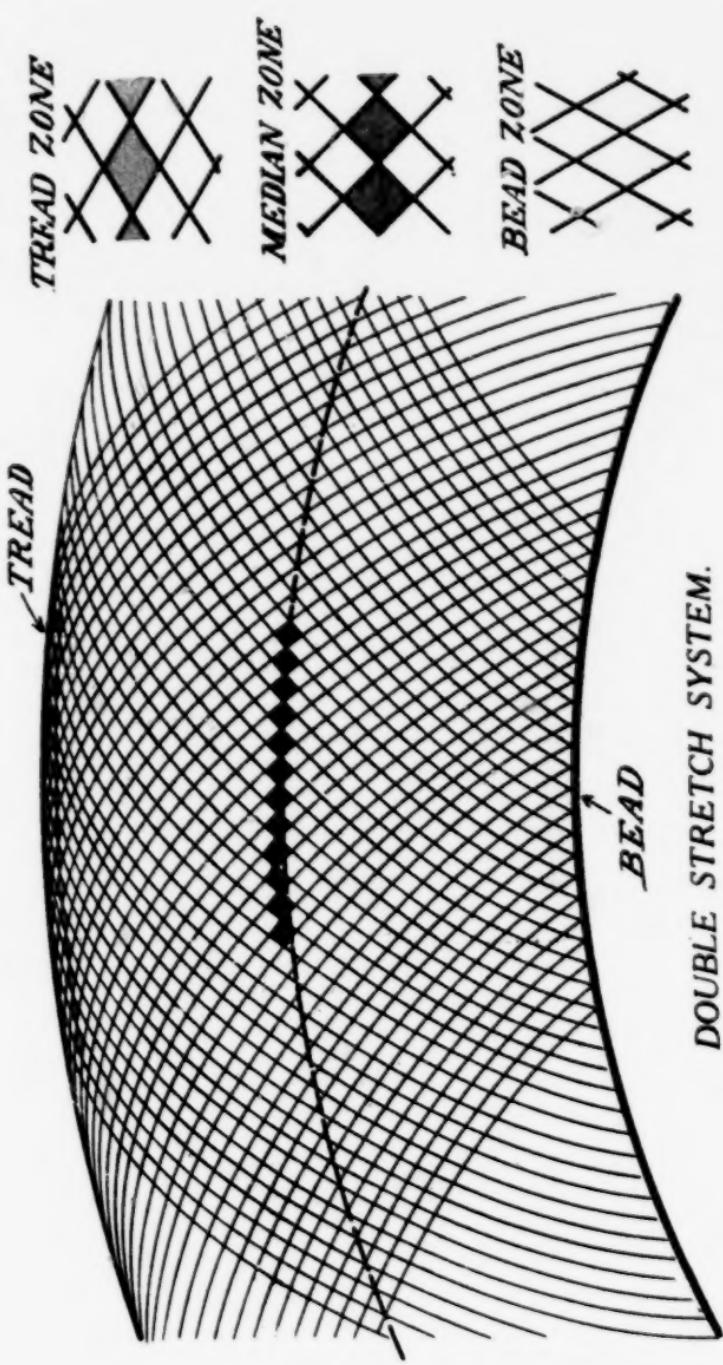
Not only must the cords of the fabric be arranged in correct position, but it is likewise important that the fabric should be smoothly laid. Wrinkles and uneven places are objectionable, because a wrinkle traps a certain quantity of air which expands when the tire is vulcanized, and rapid wear of the carcass at this point results. Again, the effect of a wrinkle is to divert the strain-taking cords from their proper paths, thus making them slack and preventing them from usefully taking the strains (Vol. I, p. 434, Q. 6).

Rearrangement of Fabric Reticulations.

The tire is formed by laying successive layers of flat fabric (previously impregnated with rubber) about a ring-core, which at its periphery is of greater circumference than at its base. It is obvious that a strip of canvas extending around the periphery of the core would be longer at its edges than the circumference of the core at the base. Thus, taking a flat strip and laying it down on the sides of the core would necessarily involve the gathering and puckering of its sides. The problem is so to shape and form the flat sheet of fabric that it will accurately and smoothly conform to the core. Plaintiff's Exhibit No. 4, Original Flat Fabric Before Shaping, reproduced herewith, illustrates the ordinary arrangement of the fabric mesh. As shown in this diagram, the threads of the fabric (known as "warp" and "weft") cross each other at right angles, but by reason of the fact that the canvas or duck is cut on the bias, each thread extends at an angle of 45° to the length of the strip. Such a strip can be stretched either longitudinally or laterally to a

*ORIGINAL FLAT FABRIC
BEFORE SHAPING.*





DOUBLE STRETCH SYSTEM.

limited extent without weakening the threads, and such stretching will elongate the square reticulations of the fabric and make them diamond or lozenge shaped. Further, and by this longitudinal and lateral stretching, the flat fabric is made to conform to the contour of the core.

As indicated in the diagram, the middle of the fabric can be stretched longitudinally to shape it to the periphery or middle zone of the core. This stretching will be of the maximum extent at the central line of the middle zone or tread portion, and on each side of this middle line the stretch is less and less until the circumferential lines of the core (because of their decreasing diameters) are of the same length as the original fabric. The lines where no such stretch occurs are indicated at the portions designated "median line" in the diagram. This leaves the outer portions or skirts of the fabric, beyond the median lines, entirely unstretched and consequently not shaped so as to conform to the inner portions of the sides of the core. But these skirts of the fabric can be stretched laterally or in the direction of the radius of the core, thus elongating the reticulations of the skirts in a direction at right angles to the previous lengthwise elongation. By this latter operation, the skirts of the fabric are radially stretched and circumferentially contracted so that they will fit snugly and without wrinkles to the sides of the core.

This effect is illustrated in Plaintiff's Exhibit No. 5, Fabric Shaped to Core, reproduced herewith. This shows the fabric finally applied to the core, and also illustrates on a larger scale in small figures at the right, the effect produced upon the crossings of the threads. As thus indicated, the threads at the tread zone are elongated circumferentially so that the original square reticulations are converted into diamonds or lozenges with the long dimension circumferential. At the median zone the fabric is not stretched either longitudinally or radially and accordingly the threads cross each other at the orig-



attached to the tread zone by circumferential stretch, after which the skirts were worked down on the sides of the core by radial stretch. State testifies to the same effect on pages 303 and 304, Vol. I. For a more connected description of the operation, reference may be had to Browne's testimony (Vol. I, p. 434, Q. 7). An exhibition of this hand practice was given in the Court of Appeals below.

There was employed a revoluble ring-core, the surface of which had the shape in cross-section of the inside of the tire carcass. This was mounted on a swivel so that the core could be placed either in vertical or horizontal position. The core being in a vertical plane, the end of the strip of fabric, previously made sticky by the impregnation of rubber, was secured to the core at one end, whereupon the core was held fast against rotation and the operator forcibly pulled the fabric toward him. By a repetition of such pulls the central region or middle zone of the fabric, that in contact with the convex tread portion of the core, was stretched longitudinally with respect to the length of the fabric and circumferentially of the core. This operation is illustrated in Plaintiff's Exhibit No. 11, Manual Circumferential Stretching, reproduced herewith.

The workman by his successive efforts stretched the central zone of the strip until it extended entirely around the core and its two ends overlapped each other. The result of this hand stretching of the middle zone was to elongate that portion of the fabric so that it conformed to the tread portion of the core. This left the skirts of the strip not only unattached to the sides of the core, but in a loose and baggy condition, as indicated in the picture. So much for the first or circumferential step of the double stretch method.

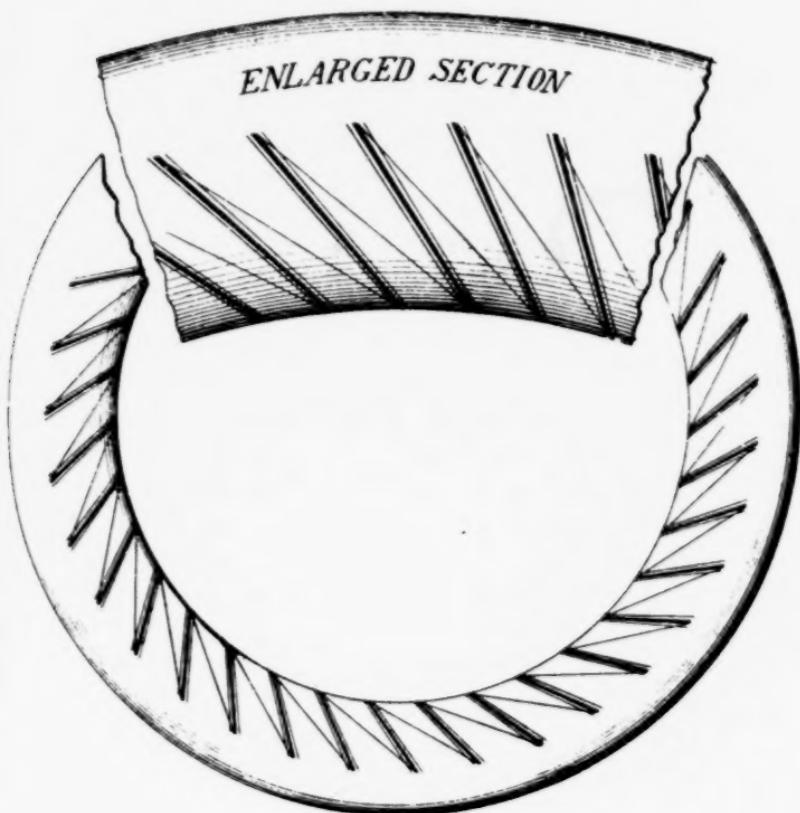
To finish the application of the fabric to the core in a smooth and unwrinkled condition, it was necessary to get rid of the looseness in the skirts during their applica-

tion to the sides of the core. This was accomplished by the action of the workman with a hand-held tool, either a wooden spatula called a "paddle", or else a "stitcher" consisting of a rotatable disc mounted in a handle. The characteristic action of forming and shaping the loose skirts of the fabric to the sides of the core was the reciprocation of this tool by one hand of the workman in a direction approximating to the radius of the core, this reciprocation being effected along one line and its return by a more oblique path to another line, where the reciprocation was repeated. The line along which the tool was thus moved is indicated in Plaintiff's Exhibit No. 7, Sketch of Sawtooth Method, reproduced herewith. Because of its serrated path, which resembles in form the periphery of a circular saw, the name "sawtooth" has been employed to designate it.

While the workman reciprocated the tool by one hand, he held the edge of the fabric with his other hand and pulled it so as to keep it taut. The consequence was that the reciprocating movement of the tool gathered a small amount of fullness at each stroke, the tendency being to make a great number of little tucks or flat arches which were so skillfully formed that they were ironed out almost as a part of the act which produced them. In this way the workman stretched the fabric radially and at the same time pressed it against the sides of the core, the radial stretching conforming the skirts to the sides of the core in a manner analogous to that in which the circumferential stretching fitted the middle portion to the tread zone. This constituted the final step of the double stretch method.

The foregoing hand practice is the one described by the Sixth Circuit Court of Appeals in that portion of its opinion quoted by Judge Buffington. It was not confined to the Goodyear plant but was the common and standard practice employed by the great majority of other tire companies, as will later appear.

SAW TOOTH PATH OF HAND TOOL





For completeness, it may be stated that if the fabric was not perfectly formed by the sawtooth manipulation, or if wrinkles or blisters remained, the defects were corrected by hand tools. Doctoring of this description is resorted to in connection with all tires, whether made by hand or by machine, although the necessity is reduced to a minimum by the machine of the State patent in suit.

Single Stretch Method.

There was still another method employed by some other companies, and it is important at the outset to note the distinction. *This was the "single stretch" method, which relied on circumferential stretching alone to shape the fabric to the core. No radial stretching was used at all.* It was possible to form the fabric to the core and down to the bead by circumferential stretch alone, much in the same manner as indicated in the previous picture of the workman. Of course the action produced a condition of the reticulations quite different from that shown in Plaintiff's Exhibit No. 5, wherein are illustrated circumferential diamonds at the tread and radial diamonds at the bead. When circumferential stretch alone is employed, the reticulations at the bead are not diamonds but squares (Ray, Vol. I, p. 569, Qs. 138, 139). Plaintiff's Exhibit No. 34, Tire Made by Circumferential Stretch, exhibits this clearly. As the witness points out:

"Q. 138. And do you find diamonds in the bead portion of this tire, Plaintiff's Exhibit No. 34?

A. No, there are squares in the bead portion.

Q. 139. Are there any diamonds at all in the fabric of this exhibit tire?

A. There are no diamonds with their long axes radial, but on the sides of the tire there are diamonds with their long axes circumferential, which become more pronounced toward the center of the tread portion of the tire where they are at maximum."

The picture reproduced herewith shows the long diamonds at the periphery and the squares at the bead. The marked contrast between the two systems of single stretch and double stretch will be apparent upon a comparison of this diagram with that previously referred to. Seiberling (Vol. I, p. 395, Qs. 64 *et seq.*) refers to the use of the single stretch system by other companies. State also describes it (Vol. I, p. 304, Qs. 16, 17).

Advantages of Double Stretch Method.

The advantages of the double stretch method are obvious almost without elaboration. Naturally, if the fabric was stretched only circumferentially and not radially, the result was unbalanced. There would be too much stretch in one direction and none in the other. Seiberling testifies as to the Goodyear preference (Vol. I, p. 397) :

“Q. 84. Why was it the Goodyear Company has preferred the combined circumferential and radial stretch method to the single circumferential stretch method in the manufacture of tires?

A. Because the fabric when applied is under less tension, and it makes a stronger carcass.”

State testifies similarly (Vol. I, p. 305) :

“Q. 20. Can you tell me why the Goodyear Company made its tires with what I may term the ‘double-stretch’ method, instead of by the ‘single circumferential-stretch’ method?

A. We think it made a better, uniform, balanced tire.

Q. 21. And that was regarded as superior to the single-stretch (circumferential) method?

A. Yes.”

Moreover, the exact percentages of stretch are given. Seiberling says that in the Goodyear double-stretch hand

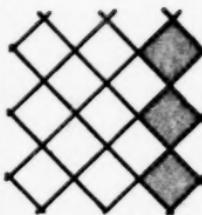
TREAD ZONE



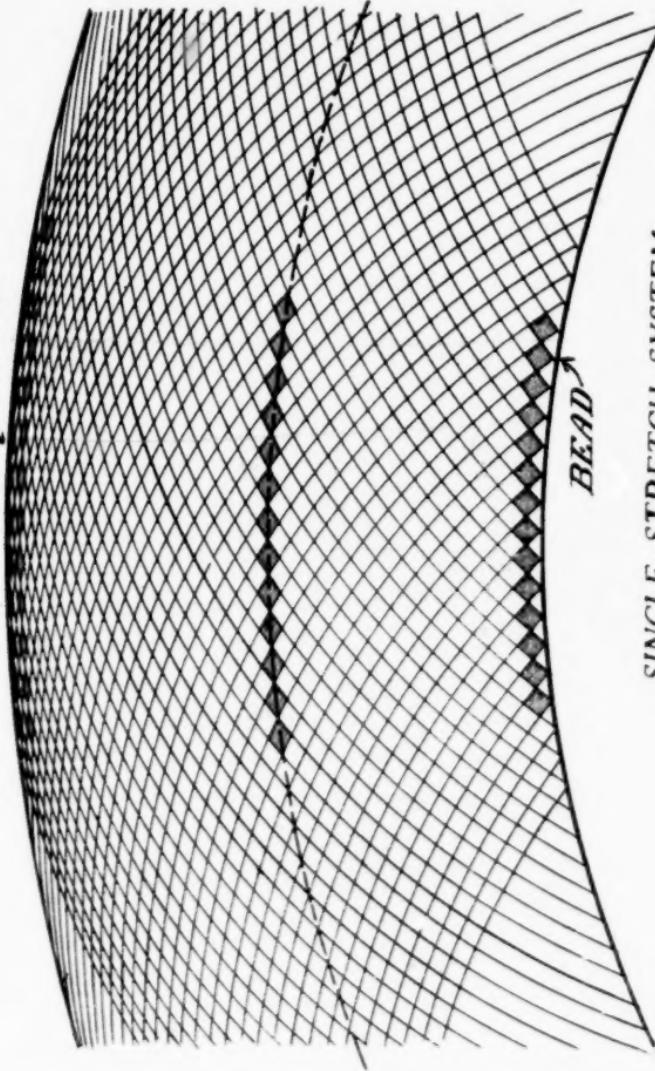
MEDIAN ZONE



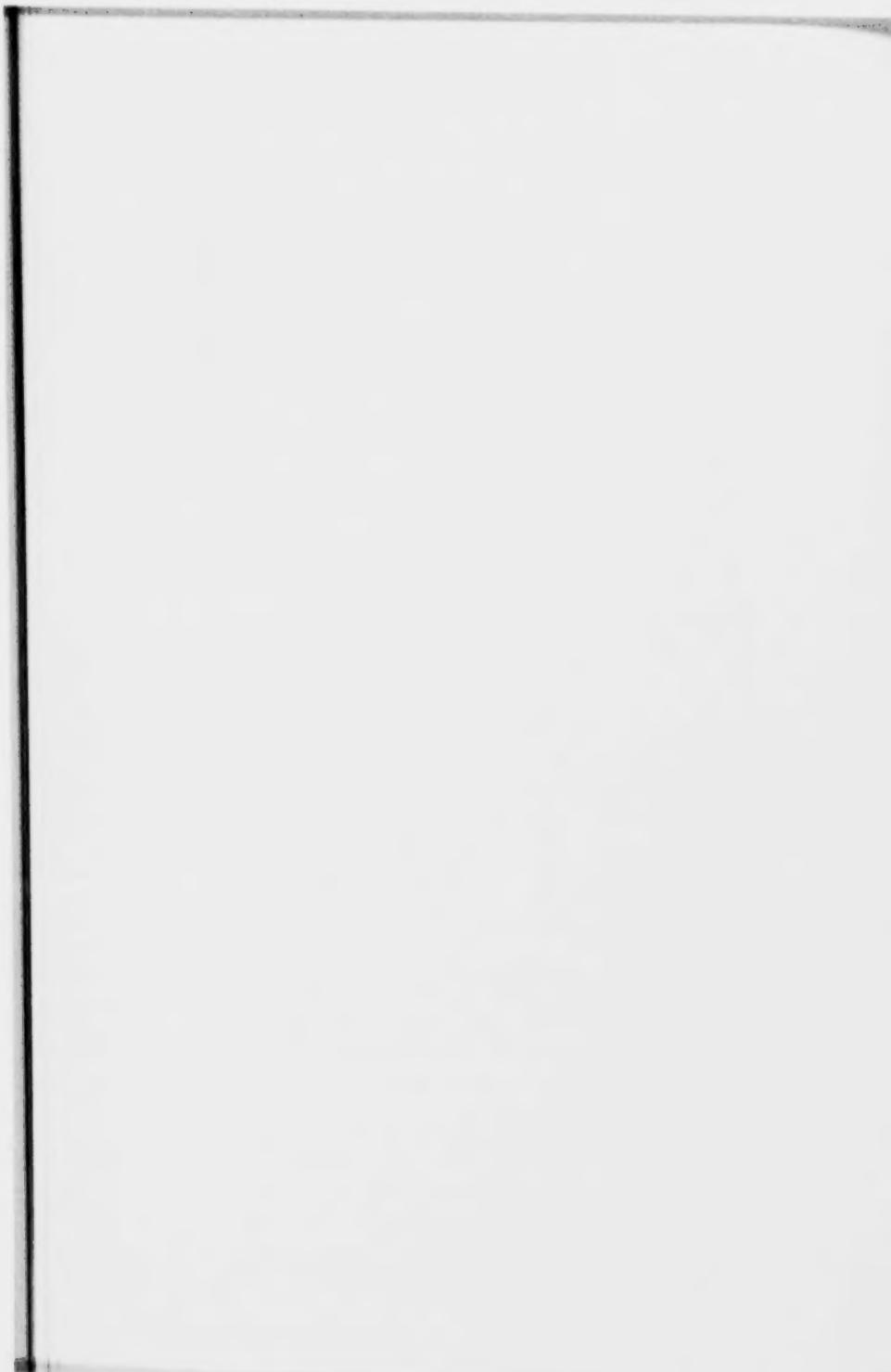
BEAD ZONE



TREAD



SINGLE STRETCH SYSTEM.



method (Vol. I, p. 387, Q. 8) the amount of circumferential stretch was "10 or 12 per cent.", and (Q. 12) the amount of radial stretch was "the same or a little more than the circumferential stretch". This indicates the substantial uniformity of tension in both directions. The percentage of circumferential stretch in Goodyear hand practice is confirmed by State, who says (Vol. I, p. 303, Q. 10) that it was about 12 per cent. This testimony is in accord with that to the effect that in this way was produced a tire having substantially uniform tension throughout.

It is more difficult to state with precision the exact line of demarcation between the two systems, but a fair consensus of opinion, as gathered from the testimony of defendant's witnesses, seems to be that a circumferential stretch of 17 per cent. or more (as to the sizes referred to) indicates the single stretch method. For instance, as hereafter shown, the Vincent machine admittedly embodies the single or circumferential stretch method, and there the percentage was 18. At this point radial stretch either has disappeared entirely, or, if any remain, is so inconsiderable as fairly to be disregarded.

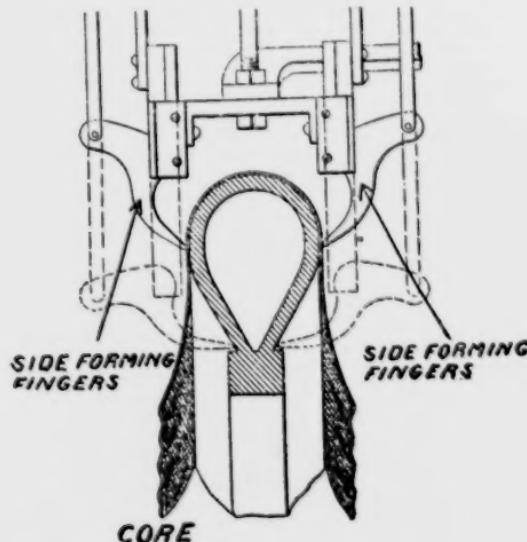
The matter of *the distinction between the two stretch methods* becomes especially important for the reason that *the State machine, as well as defendant's machine, embodies the double stretch system*. On the contrary, *the single stretch method was employed in the three alleged anticipations* on which defendant lays its greatest stress, *namely, Vincent, Mather, and hand spinning*. Defendant's expert endeavors to place defendant's machine within the single stretch system, but the contention is untenable for many reasons. For instance, Curtis, defendant's employé, admits (Vol. I, p. 299, x-Q. 66) that defendant is "using about twelve per cent. as a standard", which is exactly the same as that used in the State machine.

The Seiberling & Stevens Machine.

Proceeding with the history of the Goodyear Company in its endeavor to supplant the hand-making of tires by machinery, and remembering that its tires were of the double stretch type, the first and natural suggestion would be the endeavor to embody the sawtooth method in a machine. And this was what actually occurred, as testified to by State, Vol. I, pp. 305 to 307. This was in 1903.

The machine was equipped with fabric delivery means and tension mechanism to secure the circumferential stretch, leaving the skirts unattached in the manner previously described. It was then sought to stretch the skirts radially and apply them to the side of the core, and for this purpose was employed a pair of "jigger fingers", which reciprocated radially on the sides of the core in a path somewhat like that indicated in our pre-

SEIBERLING & STEVENS



vious sawtooth diagram. But the effort failed, as (Vol. I, p. 306, Q. 30) the jigger fingers did not form the fabric

properly. Some commercial tires were made on the machine, but it was finally abandoned and junked. The Court of Appeals for the Sixth Circuit, in referring to this machine, stated as follows:

"One machine was built, but there is evidence that no tires were successfully made upon it, and that the jigger fingers would not smooth the sides so as to make first-class tires. Certainly, its attempted use by the Goodyear Company was abandoned, the machine discarded, and no other ever built."

The Court of Appeals for the Third Circuit found likewise:

"Seiberling and Stevens' plan was to use jigger fingers, but the proof is that their jigger-finger machine was not commercially successful and was commercially scrapped."

The Seiberling & Stevens patent purported to cover this machine and was urged in the earlier litigation in the Sixth Circuit, although principally in relation to the means for obtaining the original circumferential stretch. The particular point need not be considered in the present case, which for the most part, is directed to the means for obtaining side-forming by radial stretch,—the second step of the double-stretch system. Therefore, although originally set up in the bill, plaintiff has dropped the Seiberling & Stevens patent. Moreover, it is now expired.

The Vincent Machine.

Even though it may slightly interrupt the consecutive narration, this seems to be the appropriate place to refer to the only other machine on which effort was made to produce tires commercially, viz., the Vincent machine. This is testified to by defendant's witness, Raymond (Vol. I, pp. 187 to 190).

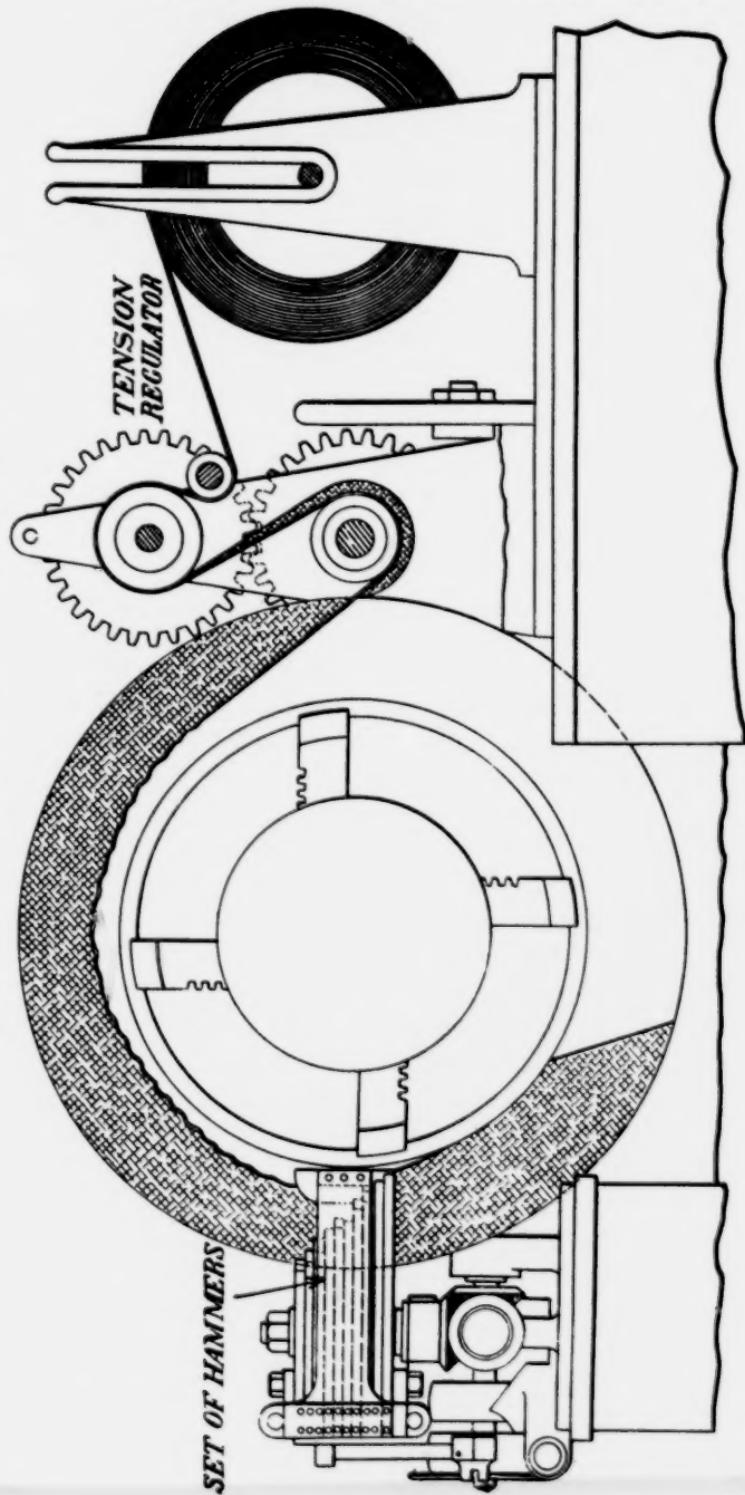
The Goodrich Company began to use it in the early part of 1907 and the witness says that some thousands of tires were produced upon it. He admits that only

a single machine was installed and that it was quickly superseded by the present Goodrich machine. So far as we know, certainly so far as the record indicates, this was the only Vincent machine ever employed in this country. Raymond says (x-Q. 15) that he knows of no similar Vincent machine now in use. Seiberling confirms this (Vol. I, p. 396, Qs. 69, 70) in stating that it was used by the Goodrich Company for "one season for a short time, and then consigned to the scrap heap", and that he knows of no other Vincent machines now in operation. There is no commercial success in such a history as this.

Even were it otherwise, there is proof that the Vincent machine was in no sense a precursor of State's machine, and for the reason that it did not operate on the double stretch system. Raymond admits (x-Q. 32) that the circumferential stretch was 18 per cent., and (x-Q. 33) that the fabric was thus "pretty well stretched down over the sides of the core". Further, referring to the Vincent machine, defendant's expert admits (Vol. I, p. 254, Q. 43) that "*it stretches the fabric so nearly to the final shape that spinning-rolls are not necessary.*" This is conclusive. In State's machine the double stretch method is adopted and spinning rolls *are* necessary.

In Seiberling's deposition (Vol. I, pp. 401, 402) appears a letter from Milan he wrote his brother in 1907, in which he repeated what he had been told about the Vincent machine in Italy. However, the user was "not permitted to show it", and all Seiberling knew about it was what was told him. He says (Vol. I, p. 412, Rd-Qs. 204, 205) that he had not seen the machine and that the statements he made were "based entirely on hearsay". In reply to this letter, Seiberling received a cable from his brother (Vol. I, p. 389, Q. 25) "not to make any arrangement" as "State had gotten up a machine that had excellent promise". This was the period when the State machine was under development.

VINCENT HAMMER PATENT





The Two Prior Machines of Seiberling & Stevens and Vincent.

These two machines, that of Seiberling & Stevens and that of Vincent, constitute everything there is in the nature of actually built machines prior to that of State in so far as relates to the manufacture of tires at all like those here involved.

When the State application was pending in the Patent Office, both Seiberling and State filed affidavits to the effect that the State machine was the first to make tires *commercially*. Both referred to the Vincent machine and pointed out that it had been abandoned. The record here completely confirms the accuracy of their statements. The Seiberling & Stevens machine produced a few commercial tires, and the Vincent machine a larger number. But both were abandoned and junked, and both have disappeared from use. As an interesting sidelight, it is pointed out that in Seiberling's letter to his brother he states, "Perelli is averaging almost 5 tires *per man per day*". This was the extravagant claim made on behalf of the Vincent machine in 1907. The State machine makes more than that number *per man per hour*.

Hand Spinning.

This subject is of primal importance, since the dismissal of plaintiff in the District Court, in this case, was based upon it. The topic was not mentioned in plaintiff's proofs in the Firestone litigation. Defendant here advances hand spinning as in effect anticipatory of State's invention, whereas plaintiff regards it as corroboration of the inventive act. Defendant in the *Firestone* case treated it very briefly in its testimony, in fact, so slightly that plaintiff regarded it as of no importance and did not respond. The Court of Appeals in that case said of it:

"* * * Considered critically, all this testimony might not be sufficiently definite and positive to pre-

vail by itself against circumstances tending to throw doubt upon it; but there are no such circumstances. When defendant's proofs closed, this proposition would ordinarily be taken as fairly established; Messrs. State and Seiberling were called as witnesses on the rebuttal; both were familiar with the history of the art; neither one denied or questioned this proposition; nor did any other witness for plaintiff."

Plaintiff thought with the Court that the testimony was not "sufficiently definite and positive to prevail by itself", and for that reason made no attempt to rebut it. However, the point will now be discussed at length and with the belief that it confirms plaintiff's contentions as to State's achievement.

Although it was not Goodyear Company practice and seems to have been unknown in its factory, there was elsewhere in vogue a certain method of making tire-carcasses known as "hand spinning". The name suggests the nature of the procedure, but to make it clearer we refer to the testimony of defendant's expert (Vol. I, p. 268, Q. 58), who first describes the original circumferential stretch and then relates how the operator applied the fabric to the side of the core in the following language (Vol. I, p. 269) :

"* * * He then caused the core to rotate rapidly and, taking a hand stitcher, applied it to the side of the core at about the edge of the part of the fabric which was adhering to the core, and then moved the hand stitcher radially inwardly while the core was in motion, pressing the stitcher laterally against the core all the time. This operation spun down the fabric on one side of the core, and it was then repeated on the other side of the core. The hand stitcher used was a disk-like metallic wheel or roller having a rounded edge and about two or three inches in diameter. It was mounted to revolve in a wooden handle."

He does not allege that the action he describes resulted in stretching the skirts of the fabric radially, as is essential to secure the double stretch method. Nor does he even allege that there was a high enough core speed to produce the necessary centrifugal force to obtain radial stretch. As defendant's witnesses testify, the core speed was altogether too low to secure this effect. *Hand spinning was in the single stretch class.* The original circumferential pull was relied on to shape the fabric to the core. The cuts in defendant's brief (pp. 4-5) are unwarranted, as the fabric strip is there shown as applied to the core with practically no circumferential stretch at all. Defendant's witness, Welch, says (Vol. I, p. 286, Q. 6) that they pulled "it on just as hard as we could"; and defendant's witness, Duncan, testifies (Vol. I, p. 197, x-Q. 28) that they preferred seventeen per cent. of stretch because that secured "the best position on the side of the tire which could be obtained with manual stretching". As Duncan says (Vol. I, p. 202, x-Q. 56), "The important thing is the stretch". And he repeats (p. 203, x-Q. 58) that the circumferential stretch applied initially is the important thing, and even says that the amount of subsequent side pressure "need be only sufficient to apply the fabric smoothly"; as will be subsequently shown, uniform and heavy side pressure is essential to radial stretching. After the fabric was entirely or largely pre-formed by circumferential stretching all that was done was to apply it smoothly to the core, and that is all defendant's expert describes in his testimony, *it being again noted that he nowhere refers to high speed or centrifugal force or radial stretch.*

There can be no dispute as to the proofs now to be analyzed, since they are practically all the admissions of defendant's witnesses.

Hand spinning forbidden. First, it should be noted that hand spinning was prohibited by the Dia-

mond Company. This is significant, since defendant places its main reliance on the Diamond practice and the majority of its witnesses were Diamond employés. Not only was it forbidden, but its practice was regarded almost as a "criminal offense", as stated by one of defendant's witnesses. Why it was so regarded will be apparent later on. The authorized practice was the saw-tooth double-stretch hand method.

Defendant's witness, Koplin, testifies (Vol. I, p. 95) not only that it was against the rules, but that the saw-tooth method was the regular one:

"x-Q. 29. Did you ever run down tires by hand after you became inspector?"

A. Not after I became inspector I didn't. The reason I didn't after I was inspector, I was breaking in new men about half the time; I was breaking in new men and inspecting both.

x-Q. 30. When you broke in new men, did you teach them to run down tires in the same way?

A. No.

x-Q. 31. Why not?

A. Because it was against the rules.

x-Q. 32. What were the rules that you followed in breaking in new men?

A. Why, to stitch the plies down by hand.

x-Q. 33. When you say 'to stitch the plies down by hand', do you mean that the ply was stitched down in a path something like as shown in this picture that I hand you? (Plff.'s Ex. No. 7.)

A. Yes. Yes, a good deal in this form. Of course, you know, after we would break them in, they would naturally break away from the hand-building, and, as I told you before, spin the tire."

Defendant's witness, Derry, testifies (Vol. I, p. 110):

"x-Q. 33. What method were you taught when you went to the Diamond Company?"

A. You was taught to pull your plies on, stitch them down with a stroke.

x-Q. 34. You mean somewhat after the fashion indicated in Plaintiff's Exhibit No. 7?

A. Yes, that's all right. Yes, sir, that's what we call the stroke.

x-Q. 35. That was the method you were taught?
A. Yes, sir.

x-Q. 36. Did you have any difficulty in spinning the core on the stands that were in use at the Diamond plant?

A. Only difficulty ever I had was to keep away from the boss on it.

x-Q. 37. In other words, that spinning method of making tires was not approved by the inspector, the authorities at the Diamond?

A. No.

x-Q. 38. And for that reason you were taught the saw tooth method?

A. Yes, sir."

And again (Vol. I, p. 113) :

"x-Q. 61. I understand you used this hand-spinning method only when the boss wasn't looking?

A. Yes, sir.

x-Q. 62. What would have happened if he had seen you doing it?

A. A bawling out, I suppose."

Defendant's witness, Drach, although contradicting himself repeatedly, states (Vol. I, p. 104) that the hand spinning method was *finally abandoned* in favor of the sawtooth method to get better radial stretch:

"x-Q. 52. Then I understand your testimony to be that in 1910 the Diamond Company changed from the hand-spinning method to the stitching method, as indicated in this Plaintiff's Exhibit No. 7?

A. Over the bead.

x-Q. 53. What was the reason they gave for changing from the hand-spinning method to this other stitching method, in 1910?

A. Well, the stock—the stock was narrow; they changed and made it wider, and had to stretch it more.

x-Q. 54. And, to get this greater stretching, they

used the stitching method shown in this Plaintiff's Exhibit No. 7?

A. Yes, at the top of the bead they done that.

x-Q. 55. And you understood that you could get more stretching with this stitching method shown in Plaintiff's Exhibit 7 than you could in the hand-spinning method? I mean that's what they told you?

A. Yes."

Defendant's witness, Heller (Vol. I, p. 119, x-Qs. 38 to 44) confirms and describes the use of the sawtooth method at the Diamond plant.

Defendant's witness, Stark, testifies to the same effect (Vol. I, p. 133, x-Qs. 73 to 75).

Defendant's witness, Green, says that the hand spinning method was the only one in vogue at the Diamond plant, but subsequently contradicts himself and finally admits (Vol. I, p. 141, x-Qs. 54, 55) that tires were made there by the sawtooth method.

Defendant's witness, Gregg, says in effect that instructions were to work down the tire "with stroke", but that hand spinning was also performed (Vol. I, p. 147):

"Q. 11. Describe how you worked the fabric edges down on the sides of the core with the stitcher.

A. Well, if we worked it down according to our instructions, it was done with stroke. Often they would spin the core, and then would hold the stitcher against the sides of the core; hold the stitcher there —of course, if we had speed enough to start with, we would run it clear down."

He explains further (Vol. I, p. 149):

"x-Q. 28. You have referred to the method you were taught when you went to the Diamond Company. Did that method involve the use of the stitcher in a saw tooth path substantially like that shown in the sketch Plaintiff's Exhibit No. 7?

A. Yes."

Defendant's witness, Bittaker, testifies in effect that the operator was instructed to use the sawtooth method (Vol. I, p. 181) :

"x-Q. 55. Now, is it not a fact, Mr. Bittaker, that the operator was expected and instructed at this time, in the Diamond plant, to form the sides or skirts of the fabric to the core by a succession of short strokes inward toward the center of the core, and at a slight angle thereto?

A. Yes.

x-Q. 56. In other words, by what is known as the 'hand-stitching method', as distinguished from the hand-spinning method?

A. Yes.

x-Q. 57. That is to say, the path of the stitcher in this authorized form was substantially like that shown in the sketch I exhibit to you, and which is marked 'Plaintiff's Exhibit No. 7'?

A. Substantially like it, with the exception that the angle may not have been exactly the same."

Bittaker is the witness who refers to the hand spinning method as a criminal offense (Vol. I, p. 175) :

"Q. 18. How fast did the man rotate the core while stitching down the fabric?

A. In the early stages of the tire construction, rotating of the core while stitching down the plies was sort of termed as a criminal offense among the employees. Shortly after the tire construction had advanced, it was more common to see the workmen rotate the core at a very high speed while applying the fabric with the stitcher."

He explains further (Vol. I, p. 181) :

"x-Q. 58. Why did the authorities at the Diamond plant think, at the outset, that the hand-spinning method was detrimental to the tire?

A. Well, I stated previously that it was theoretical that they condemned that practice at first, thinking that the threads which composed the fabric could not be kept at a 45-degree angle."

Defendant's witness, Mell, testifies as to the practice at the Republic plant (Vol. I, pp. 153, 154, Qs. 11 to 14), the substance of his statement being that hand spinning was employed "half way down" the skirt and then the remainder was stitched down by the sawtooth method. This was the general practice (Vol. I, p. 155, x-Q. 19), and the description is further supplemented at Vol. I, p. 158, x-Q. 33. The use of the sawtooth method over the final and more difficult half of the skirt indicates the desire to obtain more radial stretch than was possible by hand spinning.

Defendant's witness, Walch, testifies to the use of the spinning method at the Ajax plant, but admits (Vol. I, p. 288, x-Qs. 24 to 26) that the operators were taught the sawtooth system.

Defendant's witness and employé, Curtis, testifies to the early use of hand spinning, but admits (Vol. I, p. 296, x-Qs. 33 to 36) the employment of the sawtooth method in the Thropp plant. His testimony is further qualified (Vol. I, p. 298, x-Qs. 49 to 51) by the statement that at the Thropp plant only the first ply was laid down by hand spinning, after which the subsequent plies, already pre-woven to circular shape, were "spaded" down, this term implying the sawtooth method.

Great skill required for hand spinning. As further indicative of the conditions, a number of witnesses refer to the skill and experience necessary to perform the hand spinning operation.

Defendant's witness, Koplin, for instance, testifies (Vol. I, p. 95):

"x-Q. 24. How do you know that it was a year and a half after you went into the Diamond employment that you began to spin down tires by hand?"

A. It was about that time. Why, a man has to have experience in the business quite a bit before he can do that.

x-Q. 25. You think, then, that it took you *a year and a half of experience* before you were able to run down tires by hand; is that what you mean?

A. Yes, so as to be a success, so they wouldn't wrinkle.

x-Q. 26. In other words, it required some skill and experience to prevent the fabric from wrinkling?

A. Yes."

And again (Vol. I, p. 96):

"x-Q. 34. You didn't think it was safe to let the new men do it until they had considerable experience?

A. Yes, it was not safe."

Defendant's witness, Mell, says (Vol. I, p. 154):

"Q. 14. About how much of the fabric on the side was laid down by the use of the stitcher; I mean how much in a radial direction?

A. Probably about half way down the side which depended somewhat on the skill of the operator, an expert tire-maker being able to roll it down further than a green operator."

Defendant's witness, Drach, says (Vol. I, p. 103, x-Q. 37) that it was difficult for a new man to "spin the core and stitch it down". Defendant's witness, Walch, testifies (Vol. I, p. 288, x-Q. 24) that "it was quite a knack to do it with the stitcher. We learned a lot of new men and they did not quite get the knack of doing it right away".

Large circumferential stretch and corresponding absence of radial stretch in hand spinning. In effect, hand spinning comes within the single or circumferential stretch system, and is distinguished from the Goodyear double stretch system. This becomes apparent in many ways. As a general rule, defendant's witnesses are unable to give or even estimate

the amount of circumferential stretch, and this is not surprising. For instance, Waleh says (Vol. I, p. 286, Q. 6) they pulled it on "just as hard as we could". Sometimes it was put on by *two* men (Bittaker, Vol. I, p. 176, Q. 26). However, there are one or two notable exceptions, as for instance, Duncan, who is a graduate of the Massachusetts Institute of Technology. His statements are most illuminating, since they clearly indicate the use of the single stretch method (Vol. I, p. 197) :

"x-Q. 27. What did you say was the average stretch employed in connection with hand made tires such as you have already referred to?

A. This will vary with different companies. We preferred to get seventeen.

x-Q. 28. Why did you prefer to get seventeen per cent. of stretch?

A. Because that brought what we called the neutral line of fabric to the best position on the side of the tire which could be obtained with manual stretching."

This is further confirmed by his testimony to the effect that circumferential stretch is the important element and governs radial stretch (Vol. I, p. 202) :

"x-Q. 56. In other words, do you regard the amount of pressure on the core as immaterial, so long as the fabric is applied thereby smoothly to the core?

A. Yes. The important thing is the stretch.

x-Q. 57. You mean radial stretch, do you not by your last reference to the stretch?

A. I mean circumferential stretch because that governs radial stretch.

x-Q. 58. Then if I understand you correctly, you regard the circumferential stretch applied initially as the important thing, and the amount of side pressure subsequently applied as relatively unimportant.

A. Yes, the amount of side pressure need be only sufficient to apply the fabric smoothly. The adhesion is obtained during the molding operation."

Defendant's witness, Mell, also a mechanical engineer, confirms the small amount of radial stretch (Vol. I, p. 157) :

"x-Q. 30. I suppose that, in connection with a core of small cross-section, the amount of subsequent side-forming is inversely proportional to the initial circumferential stretch; is that correct?

A. I say yes.

x-Q. 31. For instance, you take a core of small cross-section, say three inches across; and then you stretch the fabric thereon so as to get an 18 or 20 per cent elongation; there is very little additional forming action necessary to apply the fabric to the side of the core; is that correct?

A. Yes, not a great deal of additional forming need be done. However, the fabric had to be applied without wrinkles; and even on a small tire this took considerable care, the fabric never coming down where it lay on the core in its correct position."

The inability to obtain adequate radial stretch by spinning is further indicated by the fact that the system was applicable only to the smaller sizes of tires, as next to be discussed.

Hand spinning not applicable to large tires. Defendant's witnesses agree that hand spinning was used entirely in the production of small tires and that the larger sizes had to be made by the sawtooth method. The reason for this is obvious. There is a safety limit to the stretching capability of tire fabrics, and with cores of larger section that limit would be quickly reached. Going beyond it, the fabric would be over-stretched and weakened. With larger cores the only practical way of applying the fabric was by dividing the stretch under the double stretch system, as by the sawtooth method generally employed for the purpose. The witnesses are practically unanimous as to the facts:

Defendant's witness, Koplin, testifies (Vol. I, p. 96) :

"x-Q. 35. Did you ever use this hand-spinning method continuously all day at the Diamond plant?

A. No, I couldn't do it only on small tires. The large tires the fabric was too stiff."

Defendant's witness, Derry, says (Vol. I, p. 113) :

"x-Q. 65. Why didn't you use the spinning operation on the larger-size tires also?

A. It wouldn't work as well.

x-Q. 66. Why not?

A. Too much fabric. The wider the plies, the harder they are to pull on by hand. We didn't have any machines in those days."

Defendant's witness, Heller, states (Vol. I, p. 119) :

"x-Q. 46. In other words, you found the hand-stitching method more difficult to perform in connection with the larger-size tires because there was a greater amount of fabric to shape down on to the core; is that correct?

A. Yes.

x-Q. 47. You understand, of course, that I am now talking about the hand-spinning method?

A. Yes, sir."

Defendant's witness, Green, testifies (Vol. I, p. 138) :

"x-Q. 35. Was that the case with all sizes of tires at the Goodrich plant?

A. On different sizes that I worked on it would work out that the smaller tire would work better."

Defendant's witness, Gregg, is particularly explicit (Vol. I, p. 149) :

"x-Q. 30. In using the hand-spinning method you have been taking about, did you use it on all sizes of cores?

A. No, sir. Only on the smaller sizes, anything from 4-inch down."

And again (Vol. I, p. 150) :

"x-Q. 38. In using the spinning method on the larger-size tires, did you have any other difficulty than that involved in imparting the proper momentum to the heavy core?

A. Yes, sir.

x-Q. 39. What were these other difficulties?

A. We had the difficulty of keeping the fabric from—well, you might say wrinkling.

x-Q. 40. There was a tendency to wrinkle, was there, in the plies of the larger-size tires?

A. Yes, sir."

And again :

"x-Q. 42. If I understand you correctly, what you mean to say is, that, in the tires of larger cross-section, there was more fabric to lay down; and, for that reason, it was more difficult to do it by the spinning method; is that correct?

A. That expresses the idea, yes.

x-Q. 43. In connection with these tires of larger cross-section, when you pulled the strip onto the core, there would be a greater amount of side-stretch along the edges of the strip, would there not, than in connection with cores of smaller cross-section?

A. I don't believe that one answer can be applied to all cores. I think there would be more loose fabric in a large tire on the edges of the ply; I mean on large cross-section tire.

x-Q. 44. And this rendered more difficult the subsequent absorption of this fullness in the sides of the tires?

A. Well, you are right. There is a point, probably, you may not know in this tire business. Now, for instance, in some of these larger sizes the bead is set further in from the outer periphery of the core; and consequently there was more fabric to absorb.

x-Q. 45. And consequently, in these cases, you applied the skirts of the ply to the sides of the core, or of the tire, by the sawtooth method of stitching?

A. Supposed to."

It is believed to have been shown that hand spinning can not be used advantageously to lay the fabric on the larger cores, or when the fabric is stiff or in considerable quantity, and that to effect the desired result more radial stretch is necessary, as in the sawtooth method. This is further confirmed in the testimony:

Defendant's witness, Green, states (Vol. I, p. 145):

"Rx-Q. 90. When would the sawtooth method work better?

A. Why, if the fabric was stiff and hard, it would be easier to get it down that way."

And again:

"Rx-Q. 93. Therefore, when you were handling a layer of fabric that was stiff and hard, you would use the sawtooth method to shape it down?

A. Yes, sir. It would work it better that way."

Defendant's witness, Drach, says (Vol. I, p. 105):

"x-Q. 55. And you understand that you could get more stretching with this stitching method shown in Plaintiff's Exhibit 7 than you could in the hand-spinning method? I mean that's what they told you?

A. Yes."

By way of anticipation, it may be noted here that *State was forced to revolutionize the spinning method, and that one of his principal feats was the introduction therein of sufficient radial stretch to convert it into the double stretch system.* This improvement not only met the Goodyear requirement, but also gave the balanced tire with uniform tension. As hereafter discussed, the proofs show that by the State machine radial stretch as high as fifteen per cent. may be secured.

Core speed irregular in hand spinning. As will appear later, one of the absolute requirements to secure radial stretch is a rotative speed of the core which

is not only high but also uniform. Neither of these requisites was present in hand spinning. The lack of uniformity will first be discussed.

The testimony shows that the more prevalent practice in hand spinning was to rotate the core manually and then rely on its momentum until the spinning operation was completed. Of course, without further acceleration the speed of rotation diminished and this destroyed the uniformity. This was particularly true when the hand stitcher was pressed with considerable force against the rotating core.

Defendant's witness, Walch, states (Vol. I, p. 289) :

"x-Q. 34. While you were spinning down the fabrie on the side of the core, under the hand spinning method, did the core ever stop rotating?

A. Oh, yes; once in a while you would have to start it up again.

x-Q. 35. I suppose that depended to some extent on the speed that you originally gave to the core?

A. Yes, sir.

x-Q. 36. And I suppose also to some extent on the amount of pressure you applied to the side of the core?

A. Yes, sir."

Defendant's witness, Derry, testifies (Vol. I, p. 112) :

"x-Q. 53. When you gave the core the highest velocity you could, did the speed die down toward the close of the operation?

A. Yes, sir.

x-Q. 54. Was it ever necessary to spin the core a second time because of its tendency to stop before the spinning operation was completed?

A. Yes. Run it down on one side, and had to give it a second whirl.

x-Q. 55. What I mean is this: There was a tendency, you say, for the rotating core to slow down?

A. Yes, sir.

x-Q. 56. Was it ever necessary to give the core an additional impulse, so as to enable you to complete the spinning operation on one side?

A. Yes."

Defendant's witness, Gregg, says (Vol. I, p. 152) :

"x-Q. 52. I suppose that, if you pressed too hard, there would be a liability to slacken down the speed of the core, would there not?

A. Sure."

Defendant's witness, Duncan, testifies (Vol. I, p. 200) :

"x-Q. 38. Did it ever happen that the initial momentum given the core in rotating it was not sufficient to keep the core rotating until the spinning operation was complete?

A. It may have. If it did, it was started again."

Another method of rotating the core was to accelerate it with one hand during the spinning operation, but obviously this introduced a new element of uncertainty in that it left only one hand to hold the stitcher. Several of defendant's witnesses testified to this practice, among whom may be mentioned Stark (Vol. I, pp. 129 and 130).

Core speed too low in hand spinning. [In order to make plaintiff's position clearer as to the present topic, it seems desirable to interpolate at this point the speed requirements necessary to secure the *State mode of operation, which involves as one element sufficient centrifugal force to throw the fabric skirts outward and to hold them around and in engagement with the advancing rolls*, as will be described more in detail later on. This centrifugal force is not manifest at all at a speed of less than 80 R. P. M. and it does not become effective until "somewhere between 80 R. P. M. and 120 R. P. M." Plaintiff's expert discusses this at several points, and the

matter seems of sufficient importance to warrant a rather extended quotation (Vol. I, p. 68) :

"x-Q. 95. Then is it your understanding of the language I have quoted from the disclaimer that the unapplied fabric is thrown out to a position substantially at right angles to the plane of the core by centrifugal force?

A. I think this would be the case if the centrifugal force was being used to the best advantage. My observation is that the skirts are thrown at substantially right angles to the plane of the core when a 34 x 4 core is rotating at about 80 r. p. m., but at that speed the skirts are not smooth, but still present waves or corrugations. These waves or corrugations disappear, however, at a higher speed, such as that employed in the Goodyear commercial machines and the centrifugal force is then utilized to good advantage.

x-Q. 96. You mean the thrown-out portions of the fabric will be smooth at a speed of about 120 to 150 r. p. m. Is that correct?

A. They are smooth at that speed and become so somewhere between 80 r. p. m. and 120 r. p. m."

This proposition may be regarded as established for the purposes of this case. It is not disputed. It seems even to have been adopted by defendant. See for instance the testimony of defendant's expert near the top of page 219, Vol. I.]

Most of defendant's witnesses are unable to give the exact speed of the core. Some say it was as high as that of the core in present machines, but they mean the *original* speed of the core, and this necessarily subsequently diminished.

Defendant's witness, Walch, makes it clear (Vol. I, p. 292) :

"x-Q. 54. As I understand it, the speed of the core when you were spinning by hand depended on the way you originally spun the core?

A. Yes, sir.

x-Q. 55. And of course that original speed of rotation grew less and less and less?

A. Yes.

x-Q. 56. Now, what did you mean in saying that you thought the speed of rotation at that time was practically the same as that of the Thropp machine now; do you mean that the original speed of the core was the same or the final speed?

A. When you would start it off; of course, it would die out a little. Of course, if you did not get both sides down, why you would have to start it up again."

Only one of defendant's witnesses, Roe, attempts to give the core speed in figures, and this testimony is particularly significant since Roe is a consulting engineer and a most intelligent witness. He testifies (Vol. I, p. 168) :

"Q. 13. About how fast, if you know, were the cores rotated?

A. It would be hard to say, but I should judge from 50 to 60 revolutions per minute. It would average about that."

Accepting this average speed of 50 to 60 as a criterion, it is seen to be far below the minimum requirement of 80 to 120 previously mentioned. And it must be further borne in mind that this estimated speed did not refer to the first-mentioned practice, wherein the speed necessarily diminished, but to the other practice when the "core was caused to rotate by the left hand of the operator" (Vol. I, p. 167, Q. 11), and consequently there was no constant retardation. In other words, in the best possible circumstances, there was no speed adequate to give the centrifugal effect necessary to produce radial stretch, even though there may have been a rudimentary trace of it.

Roll pressure irregular in hand spinning.

In order to get proper results from the spinning method, there must be a considerable and certainly a uniform, pressure of the roll upon the core. This requirement is almost apparent, but defendant's witness, Roe, who is a mechanical engineer, specifically asserts it (Vol. I, p. 171):

"x-Q. 45. Would you say generally that the amount of pressure employed in this Diamond spinning process was as great as that now applied in the several machines you have been discussing?

A. Hardly. Not as uniform.

x-Q. 46. In other words, you think that the pressure applied at the Diamond plant in the hand-spinning method was not only less than that now applied in the machine, and moreover was not uniform?

A. Yes, sir.

x-Q. 47. Do you think that, in this spiral mode of procedure that you have described, it is desirable to have the pressure on the stitcher uniform?

A. I do."

In hand spinning the pressure of the roll could not possibly be uniform. It varied with the individual, with the strength and care and skill of the operator, with the method of application, etc. Some operators sat down; others stood up; some held the stitcher in two hands; others held it in one hand; some leaned the body against it; others held it at arm's length; some even used two stitchers, one in one hand and one in the other. Defendant's witness, Koplin (Vol. I, p. 97, x-Q. 47), held it in two hands and leaned his body against the handle. Defendant's witness, Drach (Vol. I, p. 100, Qs. 12 and 13), held it in both hands but away from his body. Defendant's witness, Derry (Vol. I, p. 113, x-Qs. 59 and 60), on one side of the core pressed his body against the stitcher and on the other side did not press his body against it. Defendant's witness, Heller (Vol. I, p. 122, x-Qs. 70 and

71), is unable even to estimate the pressure he applied, but (x-Q. 74) says that in the modern tire machine the pressure "is greater than a man could put on with his hand". Defendant's witness, Stark (Vol. I, p. 130, x-Q. 45), held the stitcher in one hand and turned the core with the other. Defendant's witness, Green (Vol. I, p. 137, x-Q. 21), sometimes held the stitcher in one hand and sometimes in two. Defendant's witness, Gregg (Vol. I, p. 152, x-Q. 51), is unable to estimate the degree of pressure. Defendant's witness, Roe (Vol. I, p. 171, x-Q. 44), states that some operators pressed the stitcher against the core with greater force than others. Defendant's witness, Duncan (Vol. I, p. 195, Q. 7), states that the workmen would sometimes hold a roller in each hand for application to opposite sides of the core; and (Vol. I, p. 200, x-Qs. 42 to 44) that the pressure would vary from twenty-five to one hundred and fifty pounds "according to how tired the man was"; and that he would probably be unable to exert as much pressure at the end of the day as in the morning, and (Vol. I, p. 201, x-Q. 47) that at the end of the day he would be tired and "all in"; and (x-Q. 51) that he held the roller at the end of his arm with the arm crooked.

Defendant's witness, Welch (Vol. I, p. 286, Q. 8), held the stitcher in two hands, and says (Vol. I, p. 290, x-Q. 42) that the pressure was very light and did not amount to anything, in direct opposition to Duncan's statement that it varied from twenty-five to one hundred fifty pounds.

What possibility was there in these variant practices of attaining the uniformity of roll pressure, which Roe testifies is so desirable, and which was ultimately secured in the perfected machine? State says in his patent that the work of his spring-pressed rolls (p. 5, line 119) "is far more even and rapid than in the case of a roll pressed against the core by one hand".

Other defects of hand spinning. Due to the uncertain pressure of the roll, the angle at which it was held, the difficulty in holding it firmly, the fatigue of the operator, and the general human equation, the roll would often slip or jump, resulting in imperfect and irregular laying of the skirts on the core, and often also in the scoring or abrasion of the fabric.

Defendant's witness, Waleh, states (Vol. I, p. 290) :

"x-Q. 38. I suppose if you applied a higher degree of pressure there was a liability that the stitcher would slip?

A. Yes; you had to gauge your stitcher; that is, guide it very good."

Defendant's witness, Heller, testifies (Vol. I, p. 123) :

"x-Q. 78. When you were holding the stitcher up against the tire, was there any tendency for the stitcher to jump away from the core when it encountered a splice? I mean, of course, in the hand-spinning operation?

A. Yes; that's why I generally used both hands to hold the stitcher and let it rest against the shoulder, so as to hold it steady.

x-Q. 79. When this happened, did you always succeed in getting the stitcher back to the exact same line that it was following before it struck the splice?

A. Generally go back up to the top and down over again.

x-Q. 80. In other words, it was difficult to hold the stitcher in proper relation to the core; and, when you struck a splice and the stitcher jumped away from the tire, the easier way was to begin the spinning operation over again; is that what you mean to say?

A. Yes, sir."

Naturally these difficulties were intensified when the operator was "tired" or "all in", as Duncan said was the case. The liability to jump was done away with by State.

He testifies to this effect (Vol. I, p. 372, x-Q. 659 *et seq.*), as does plaintiff's expert (Vol. I, p. 78, x-Qs. 124 and 125).

Moreover, in this type of machine, both plaintiff's and defendant's, the work is made considerably easier for the operator. Defendant's witness, Curtis, testifies (Vol. I, p. 299) :

"x-Q. 63. I suppose making tires by a machine such as the Thropp machine is considerably easier for the operator, is it not, than making them by hand?

A. It is easier and much faster.

x-Q. 64. What I particularly had in mind was that it does not fatigue the operator to the same extent, does it?

A. No; it does not.

x-Q. 65. In other words there is less exertion?

A. Yes."

Tire quality poor with hand spinning. In view of the fact that the hand spinning system was quicker, cheaper, and simpler, there could be only one reason for prohibiting it and finally abandoning it altogether, and substituting the slower, dearer, and more complicated sawtooth method, viz., that the quality of the product was poor. This is admitted by several of defendant's witnesses.

Defendant's witness, Drach, testifies (Vol. I, p. 102) :

"x-Q. 32. At what time?

A. Well, about the time I was ready to leave the employment, they changed. The tires wasn't coming what they should be. They had a new system there then, changed the system; and I left for outside work."

He says (x-Q. 33) that there were air pockets.

Defendant's witness, Bittaker (Vol. I, p. 181, x-Q. 58) says that the Diamond authorities regarded hand spin-

ning as detrimental because they thought "that the threads which composed the fabric could not be kept at a 45-degree angle".

Defendant's witness, Koplin, states (Vol. I, p. 95, x-Qs. 25, 26) that it required skill and experience to prevent "wrinkling". Defendant's witness, Heller (Vol. I, p. 119, x-Qs. 46, 47), testifies in effect that there was too much fabric to be formed by hand, particularly in the larger sizes.

Defendant's witness, Derry (Vol. I, p. 113, x-Qs. 65, 66), affirms this. So does defendant's witness, Gregg (Vol. I, p. 150, x-Qs. 39 to 41), and he also refers to "wrinkling". Etc., etc.

There were also other reasons for the poor results, as to which argument is superfluous in view of the admitted facts. All of these faults have been corrected by State, and quite irrespective of whether the tire be large or small, by the introduction of adequate radial stretch and his other improvements and changes.

The Court of Appeals for the Third Circuit on Hand Spinning. Judge Buffington, in summarizing the defects of hand spinning, stated as follows:

"This hand work required high skill and was physically hard on the operator. The core had to be actuated by one hand and the spinning roll directed by the other. Where the different layers of fabric overlapped, the roll was apt to jump. The initial speed of the core could not be maintained unless one hand of the tire maker was employed in revolving it and if one hand was so employed its non-use on the spinning roll of course made the roll jumping trouble more acute. Moreover, the variation in speed caused corresponding variation in the regularity and uniformity of the interstices of the fibrous material, and the output was limited to the strength and skill of the operator."

Unsuccessful Attempt to Embody Spinning in a Machine.

Still another indication of the difficulties inherent in the hand spinning method is provided by defendant's witness, Gregg. In an endeavor to improve it (Vol. I, p. 148, Qs. 18 to 25) he employed a power-driven core for a time, but it was a mere *experiment*. He selects that term himself in describing his efforts (Vol. I, p. 150, x-Q. 35). He says (Vol. I, p. 149, Q. 26) that he was at it "about a month", after which he abandoned the scheme and returned to the ordinary hand method (Vol. I, p. 151):

"x-Q. 49. You say you worked on it about thirty days, to the best of your recollection?

A. About that.

x-Q. 50. And then what line of work did you take up?

A. I went back to build the ordinary way, customary."

Even if the scheme had been a success, it could have no anticipatory effect for the reason that the date was not proved. Gregg admits he is unable to fix the time:

"x-Q. 47. What was the exact date, for instance, when you worked on this experiment with the belt-driven core?

A. I wouldn't attempt to give you the exact date.

x-Q. 48. Well, can you give the year?

A. Not positively."

The only other witness on this point is Bittaker, and he breaks down entirely on cross-examination, which it seems unnecessary to review beyond stating that he gives three distinct and conflicting dates for Gregg's experiment.

While the testimony is worthless to defendant, from a different viewpoint it is valuable to plaintiff. Gregg experimented and failed. State persisted and succeeded. Courts have frequently held that fruitless efforts of this description indicate that the final successful development by another must have been difficult of attainment.

Expanded Metal Co. v. Bradford, 214 U. S. 366 (381):

"It may be safely said that if those skilled in the mechanical arts are working in a given field, and have failed, after repeated efforts, to discover a certain new and useful improvement, that he who first makes the discovery has done more than make the obvious improvement which would suggest itself to a mechanic skilled in the art, and is entitled to protection as an inventor."

Agawam v. Jordan, 74 U. S. 583:

"The settled rule of law is, that whoever first perfects a machine is entitled to the patent, and is the real inventor, although others may have previously had the idea and made some experiments towards putting it in practice."

The Development of the State Machine.

This matter was not touched upon in the *Firestone* case. It is presented for the first time and to rebut defendant's hand spinning evidence. It was not reviewed nor even mentioned in Judge Bodine's opinion in the trial Court. The Court of Appeals below, however, recognized the importance of State's development work and, after finding that the machine was directed to a true combination of elements, stated as follows:

"And not only is this conclusion the inevitable sequence of a clear understanding of the process, but the question of aggregation and combination is strikingly solved, and practically answered by a study of the evolutionary processes or stages by which through some fifteen different steps the patentee

gradually evolved in the tire-building art, the successful co-relation and adaptation of well-known hand operations to machine operations. The problem was one of great difficulty. It was not solved even by a single inventive thought or by its initial conception, but with the settled purpose in view of substituting machinery for hand work and automatic machine control for human skill.

State went through a most unusual series of experiments, and as each one was made it disclosed some difficulty which he had to overcome and did overcome step by step until at last he evolved a structure which did by rapid machine work, and largely by automatic operation, what was previously solely and laboriously done by exhaustive hand work. That the result was novel, is established by proof. That it was useful is shown by its prompt and general adoption as well as by the vast aggregate of its product, and that it was inventive is demonstrated not only by its own facts but it is evidenced by the cases decided by many different judges in this judicial circuit, who have from time to time carefully followed a clear controlling principle in dealing with the question of aggregation or combination in machines."

It should be remembered that the question of State's originality is not before the Court. *Prima facie* proof of that is afforded by the issue of his patent, and that stands. Defendant in its answer denied originality and attributed the invention to other named individuals, but the defense was afterwards dropped and no proofs were advanced to support it.

Here was the situation that faced State when he began his experiments. Goodyear practice demanded a tire possessing *uniform tension* and *this was possible solely by the use of the double stretch system*. The only way the result had been previously obtained was by the saw-tooth method. The effort to embody that method in mechanism had signally failed, that is to say, so far as

the conforming of the skirts of the fabric to the core was concerned. The Seiberling & Stevens machine had developed fabric supply means and also tension devices to give the circumferential stretch, but the jigger fingers relied on to impart the radial stretch to the sides of the tire were ineffective. The situation was discouraging. The only thing open to State was the hand spinning method, and this was full of imperfections, and in addition was incapable of producing adequate radial stretch, which, if present at all, was merely as a rudimentary trace.

In the preceding sections has been given a statement of the defects in hand spinning and this statement is based on the admissions of its friends and sponsors, not upon the testimony of inimical critics.

The case seemed almost hopeless, but nevertheless State took it up and worked at it for months. His apparent lack of progress at times was disappointing but he persevered. In the course of the work he devised a considerable number of different embodiments, each to be superseded by another, until success finally came. He backed and filled, advanced and retreated, but at last turned out one of the most remarkable commercial machines of modern times,—one which not only eradicated the faults and defects of the hand spinning method, but which also produced uniform tires having balanced circumferential and radial tension quite irrespective of whether they were large or small. As this Court said in *Diamond Rubber Co. v. Consol. Rubber Co.*, 220 U. S. 428 (435) :

"Nor does it detract from its merits that it is the result of experiment, and not the instant and perfect product of inventive power."

In other words, he converted a defective hand method and a poor product into a perfected commercial machine

and a high-grade product. The Courts have always looked with favor upon such achievements. The leading case, discussed hereafter, is *Hobbs v. Beach*, 180 U. S. 383, wherein this Court held invention in similar circumstances. The machine there involved and its product were extremely simple. When the product is complex, and therefore more difficult to make, the end attained is correspondingly more meritorious. This is one reason the structure of the tire carcass and the peculiar nature of its thread reticulations have been dwelt upon.

State's deposition. State, beginning with Q. 7 (Vol. I, p. 303), describes the Goodyear hand method, wherein the circumferential stretch was about twelve per cent., and proceeds (Q. 12) to describe the sawtooth operation. He points out (Qs. 15 *et seq.*) that this involves the double stretch system as distinguished from the single circumferential stretch plan, and says (Q. 20) that "it made a better, uniform, balanced tire", and for that reason (Q. 21) was regarded as superior to the single stretch method.

Then (Vol. I, p. 305, Qs. 22 to 35) he tells of the Goodyear endeavor to embody the sawtooth method in the Seiberling & Stevens machine, and testifies that the jigger fingers were unsuccessful. It should be noted (Qs. 34, 35) that he saw this machine operate and that the highest speed of the core therein was about 30 R.P.M. This is important as bearing out the claim that State produced the first high speed core ever used commercially. The Seiberling & Stevens machine (Qs. 36 *et seq.*) was junked and the Goodyear Company continued its old hand practice, and this condition continued for three and one-half years during which it was in financial difficulty.

State began his experiments (Vol. I, p. 307, Qs. 40 *et seq.*) early in 1907 and attained success the latter part of the same year, the machine being put into commercial

operation in the early part of 1908. These dates will probably not be disputed, but in any event they are fully corroborated. He says (Qs. 44 to 47) that it was his endeavor to embody in a machine the double stretch system previously in vogue at the Goodyear plant, and that as a matter of fact there was a general order that only this type of tire should be manufactured.

He testifies (Vol. I, p. 308, Qs. 48 to 56) that he learned of the hand spinning method, although it had never been used in the Goodyear plant and he had never seen it. He heard of it first from McDonald, and McDonald demonstrated and illustrated it for him as the basis of his experiments. State then begins to detail the course of his development (Q. 57 *et seq.*) and to make his story clearer, he produces a series of rough sketches, which have been introduced in evidence as Plaintiff's Exhibit No. 8 (Vol. 2, pp. 65-97). These sketches (Vol. I, p. 332, Qs. 233 to 236) were State's own idea, as he thought that they would make his testimony more intelligible than mere verbal description. It will be understood that they do not purport to give exact proportions, and that their sole purpose is to indicate what he did better than he could do it by words alone. The sketches are consecutively numbered, generally in the sequential order of the various devices, although perhaps not always in exact chronological order.

1st Device. This was a manually operated device (Vol. I, p. 310, Qs. 63 to 72), wherein the handle C could be used either in connection with the worm A to secure the initial circumferential stretch, or on the shaft D to spin the core, the endeavor being to use a slow speed for the original stretch and a higher speed for the spinning operation. Obviously, the core could be rotated faster by the handle than in the hand spinning system, perhaps 75 or 80 R. P. M., but the operation was unsuccessful.

He gives some of the reasons for this in his answer to Q. 68:

"A. In using the hand tool, the hand spinning tool, it was hard to guide it. It would jump in and wrinkle the fabric. It didn't seem possible for it to hold it steady enough. You couldn't gauge the advance of the stitcher, you couldn't control it; it jumped. It wouldn't stitch it down even. It would lead in just like a thread. You would miss a lot of the fabric and not roll it down. His hand off, and come in contact with the fabric; holding it with two hands, and would throw a lot of wrinkles in it, in the edge of it."

In addition, the roll jumped at the splice, there was no "appreciable degree of radial stretch", and no sufficiently high speed of rotation to obtain the necessary centrifugal force. It should be noted how accurately this experience corresponds with that related by defendant's witnesses. These first tires were bad. In this arrangement, to procure the original circumferential stretch, the fabric was held and retarded by the hands of the operator, and State next attempted to do away with that necessity.

2nd Device. In this form (Vol. I, p. 311, Qs. 73 to 76) he added another stand to carry the roll of fabric, and used a brake and weights to obtain the necessary resistance for the initial circumferential stretch, but there was no change in the manner of working down the skirts of the fabric. The tires thus produced (Vol. I, p. 342) were not good nor commercial, being badly wrinkled and requiring a large amount of hand work to patch them up.

3rd Device. Here (Vol. I, p. 312, Qs. 77 to 83) State starts in an endeavor to obviate the difficulties inhering in the spinning operation. Because of the trouble involved in holding the stitcher firmly he devised the horseshoe plate or rest R, shaped so that it would surround the edge

of the core, and on which the operator could rest his hand and thus steady the tool, but (Q. 81) he was still unable to get the requisite amount of radial stretch. He also devised a special form of stitcher with a spring inserted between the roller and the handle, so that it could be held against the fabric more satisfactorily and would not jump. The tires were still bad (Vol. I, p. 344), and the few that were taken out were "torn down and rebuilt by hand". In addition, the fabric was badly scored.

4th Device. This (Vol. I, p. 313, Qs. 84 to 91) is the first instance of the core being driven by power, his idea being (Q. 87 *et seq.*) "to get a higher speed than a man could do it by a crank" so as to obtain greater centrifugal force and *lessen the wrinkling*. This was attempted by the use of a belt from the line shafting. However, the effort was unsuccessful and the tires were still bad (Vol. I, p. 344, x-Q. 373). Most of them were torn apart and the remainder patched up.

5th Device. The previous driving means being unsuccessful (Vol. I, p. 314, Qs. 92 to 98), State next attempted to employ an electric motor, its speeds being varied by a rheostat, but again the effort failed. The speed range (Vol. I, p. 346, x-Qs. 382, 383) was from 70 to 85, but (x-Q. 385) the tires were still very poor. It will be noted that State was approximating the necessary speed but had not yet obtained it, and in addition, he was still employing the spring stitcher and the horse-shoe rest.

6th Device. Here (Vol. I, p. 314, Qs. 99 to 103) his improvement related to the fabric supply means, the principal addition being a second roll of fabric which could be used when desired. The tires (Vol. I, p. 340, x-Q. 405) were "no better". The speed was the same as in the previous devices, and as already pointed out, not yet sufficient.

Sketch 7. This apparatus marks an advance involving the abandonment of the hand stitcher. It was not successful but was a step in the right direction. He employed an additional stand **R** supporting an adjustable bar or rest, and also a pair of tongs **S** to carry the rolls, as best shown in the smaller figure. These tongs were operated by hand and rested on the bar. In this way, State hoped to give the necessary pressure on the fabric, advance the rolls with some degree of regularity, and also operate on both sides of the core simultaneously, but again he was disappointed. "The tongs would tip and cut into the fabric, and wrinkled it, and were very hard to hold" (Vol. I, p. 316, Q. 112). In this apparatus State also managed to get a little higher speed (Vol. I, p. 350, x-Qs. 432, 433), up to 90 or 95. This he did by changing the pulley diameters on the motor. Notwithstanding the fact that he was raising the speed, it was still not adequate, and in addition the tong arrangement did not work satisfactorily. The tires (Vol. I, p. 351, x-Q. 443) were still "very poor".

Sketch 7a. Next (Vol. I, p. 316, Qs. 115 to 123) State increased the fabric supply so that he had four rolls available. In addition, he employed for the first time a *speed change mechanism*, a low speed for circumferential stretch, and a high speed to rotate the core rapidly. This two-speed mechanism is substantially equivalent to that shown in his patent and embodied in his commercial machine, although there improved and refined. He says (Q. 123) that prior to his experience he had never "seen or known of a high-speed core". He is not certain just what the speeds were, but endeavors to estimate them (Vol. I, p. 351, x-Q. 45) at 10 or 12, and 85 or 90, respectively, although he says (Vol. I, p. 353, x-Qs. 462, 463) that the high speed may have been "about a hundred" and the low speed 9 or 10. However, he made no tires at this

time (Vol. I, p. 352, x-Qs. 455, 456) as he was "just working out speeds"; there were no side forming devices; later on he made tires, with the apparatus as shown in the next sketch.

Sketch 7b. This apparatus (Vol. I, p. 318, Qs. 124 to 135) is substantially the same as that last referred to, but adds a different means for supporting the tongs first shown in Sketch 7. He substituted for the rest, a movable table or slide on which the tongs were mounted. This slide is shown at M and its movement was effected and controlled by the lever W. He again encountered difficulty (Q. 134) because "the contact of the rolls with the side of the core tended to pull the slide in" and (Q. 135) he could not "get a uniform advance of the rolls". This step is of interest in that such a slide was employed in the completed machine, although with totally different operating and controlling means, as will presently appear. The speed (Vol. I, p. 356, x-Q. 499) was about 95. The general evolution is apparent. He had worked up almost to the required high speed of core rotation, and moreover, was having somewhat better results in the control of the rolls. This becomes further apparent from the fact that although (x-Q. 498) the tires made thereon were not "salable and usable", nevertheless (Vol. I, p. 355, x-Q. 489) they "were just beginning to get a little better".

Sketch 8. Here (Vol. I, p. 319, Qs. 136 to 144) was another step in advance, and an important one. He still used the slide M and the tongs mounted thereon, but in order to overcome the troubles involved in the use of the controlling lever W, and to secure a uniform advance of the slide, he substituted for it a screw, which had two functions (Q. 139), since it enabled the operator to advance and retract the slide at will, and moreover resisted the tendency of the rolls to pull the slide in. In addition,

the tongs were provided with a spring **S** (Q. 141) whereby the rolls were forced together by a yielding or spring action. Also, he employed a wheel **H** and handle **X** to turn the screw, the wheel being formed with several holes (Q. 143) so as to control the hand operation of the screw in relation to the speed and regularity of advance. It is noted that this screw arrangement was embodied in the final commercial machine, although there was still a considerable degree of alteration necessary in connection with it. A few tires (Vol. I, p. 359, x-Qs. 526, 527) were made on this machine of about the same quality as those on the preceding apparatus.

Sketch 9. This stage marks the abandonment of the tongs, and (Vol. I, p. 321) there appears in it for the first time the two distinct stitcher arms separately pivoted on the slide and each provided with a spring, in a manner somewhat approximating the final arrangement. Another point of interest is that each of the arms was formed with a control handle whereby the operator could either augment or diminish the pressure, also as contained in the final machine. However, there was much to be done yet in connection with these elements. The arms were not properly shaped, nor properly located, and the flat springs were not efficient. The high speed (Vol. I, p. 359, x-Q. 532) State estimates at 110, 112, 115, and the tires (x-Q. 529) "were getting better on that machine; better tires made on that than the previous ones". Progress was being made now, although still slowly.

Sketch 10. There are several changes here (Vol. I, p. 322). For instance, the inefficient flat springs of the previous form were dropped and in place thereof the arms were experimentally connected by a single spiral spring located in advance of the pivot. As will be seen, this arrangement was not finally adopted. Perhaps the

principal point in this stage was the provision of a new form of slide, it having two parts M and M¹, the latter being mounted upon the former and connected thereto by adjusting screws, so that the position of the table proper M¹ could be varied to locate the rolls at different heights. The vertical position of the rolls in reference to the core proved to be most important. For instance, if they were too low there was a tendency to wrinkling, and (Q. 153) there "was a lot of experiment on it", at least several days (Vol. I, p. 361, x-Q. 545); and (Vol. I, p. 322, Q. 151) "the final adjustment as to height was a fraction above the center". He experimented also to find the proper direction of rotation (Vol. I, p. 377, x-Qs. 710, 711). The speed (Vol. I, p. 359, x-Q. 533) was "about 110 or 115". The tires (Vol. I, p. 360, x-Q. 536) "showed up fairly well". "They would have been salable tires; but they used them on tests" (x-Q. 537). Here is evidence of encouraging progress.

Sketch 11. The principal change here (Vol. I, p. 323, Qs. 159 to 165) was in the arrangement of the stitcher arms, which were made shorter and mounted further forward on the slide, and each provided with a flat spring, reverting in that respect to the arrangement of Sketch 9. Perhaps there was nothing revolutionary in this, but it showed the necessity for continued experiment and alteration. As State says (Vol. I, p. 361, x-Qs. 551, 552), the coil spring inside the arms not only did not give the proper pressure, but even contacted with the tread of the tire. Tires were made (Vol. I, p. 362, x-Qs. 556 to 558) on this machine, "were finished and tested, and proved good".

Sketch 12. Again (Vol. I, p. 323, Qs. 165 to 169) the flat springs on the stitcher arms proved ineffective, and therefore another arrangement was tried, namely, a spiral compression spring for each of the arms at the

outside thereof. The previous flat springs were not sufficiently adaptable about the core and "were continually breaking" and getting set. Also, there was a reversion in the shape of the stitcher arms. The best combination was hard to determine. The tires (Vol. I, p. 364, x-Q. 577) were "pretty fair tires". They required (Vol. I, p. 365, x-Q. 585) some hand work but "were getting better".

Sketch 13. Here we find the table with the several tools thereon, much as shown in the patent. This arrangement, while perhaps desirable in the commercial machine, does not interest us particularly, as substantially the only thing involved in this case is the correlative action of the forming rolls and the rotating core. It is interesting to note that again State uses flat springs for the stitcher arms. As he explains (Vol. I, p. 365, x-Qs. 586 to 591), he was "experimenting back and forth", and while the spiral springs of Sketch 12 were better than the leaf-springs, he concluded to go back and test the leaf-springs over again. This indicates the large amount of detail and testing that was necessary even in the adaptation of minor parts.

Sketch 14. This sheet (Vol. I, p. 324, Qs. 174 to 179) is of similar import and shows the various forms of screws State experimented with before he obtained the right one. As he explains, he tried both screws with square threads and screws with V-threads. Also, it was necessary to cover the surface completely and evenly and this involved determining the exact pitch. As explained by the experts, if the distance between the convolutions of the spirals be too great, the fabric will not be properly applied (Vol. I, p. 79, x-Q. 158). On the other hand, this distance should not be too small. State did not get the desired result until he had made four different attempts with four different kinds of screws.

Sketch 15. This sheet (Vol. I, p. 325, Qs. 180 to 182) shows the different forms of rolls State tried out before he found the right one. A too sharp edge would cut the fabric and he experimented with five of them and finally selected a large wheel with a blunt edge. This point is mentioned in the State specification. The cross-examination (Vol. I, p. 368, x-Qs. 619 to 655) clarifies the difficulties of State in this respect, although too long to be referred to here more than generally.

Other difficulties. In addition to the problems indicated by his sketches, State testifies as to other troubles. Perhaps some of them, considered individually, do not suggest invention, but collectively they added to his perplexity. For instance (Vol. I, p. 326, Qs. 183 to 186), the stitcher wheels had plain bearings, and during his experiments these bearings would grind out and the rolls be thrown off. He could not lubricate them, and so in the final machine he devised a form of stitcher with ball bearings. He explains (Vol. I, p. 378, x-Qs. 718 *et seq.*) that while plain bearings were used in the hand spinning operation, they became worthless when a core speed of 120 R. P. M. was attained. Of course, they would work, but they were quickly ruined.

Again (Vol. I, p. 326, Qs. 187 to 191), he had considerable difficulty in arranging the roll at the proper angle; it was necessary to press the fabric against the side of the core and also to provide sufficient frictional engagement to get the radial stretch; but on the other hand it was necessary so to locate it that the outflung skirt would not become entangled with it. After some experiment (Vol. I, p. 379, x-Qs. 726 to 735), he located the roll at a receding angle, as described in his specification and claims.

His experience in connection with his first hand spinning experiments was in line with those testified to

by defendant's witnesses (Vol. I, p. 327, Qs. 192 to 195). The skirt became entangled with the hand; it was impossible to advance the roll regularly; the advance was spasmodic; he got very little radial stretch. *All this was intensified* when the core ran at a speed higher than that of the hand operation. State testifies (Vol. I, p. 372, x-Qs. 659 *et seq.*) that the tendency of the roll to jump was materially diminished as his machine progressed, because of the better mechanical control.

Double stretch. State testifies (Vol. I, p. 307, Qs. 44, 45) that in his machine he embodied the Goodyear system of combined circumferential and radial stretch, the percentage of the former (Vol. I, p. 328, Qs. 197 etc.) being about twelve per cent. at the tread, and that of the latter as high as fifteen per cent. at the bead. This percentage of radial stretch (Vol. I, p. 380, x-Qs. 736 to 738) was determined by actual measurement. Seibeling confirms this completely (Vol. I, p. 395, Qs. 59 to 61, and Vol. I, p. 400, x-Qs. 104 to 111).

State's Assistants. In the course of his work, State was assisted by several subordinates, among whom were McDonald, Thomas, McBride, and Wattleworth. For instance, Wattleworth was a designer and draftsman and worked out some of State's ideas for him, as for example, the precise forms of springs, of screws, etc. Because of this cooperation of State's subordinates, defendant argues at length that there is evidence of joint inventorship and consequently the patent is void. However, there is absolutely no foundation for the contention. The *only* evidence in the record is that of State himself. For instance (Vol. I, p. 384):

"Rd-Q. 773. Did Mr. Wattleworth, in connection with your experimental work, operate under your direction?

A. He did.

Rd-Q. 774. Was his general mode of operation to work out suggestions made to him by you?

A. They were.

Rd-Q. 775. For instance, and purely by way of example, in connection with the screws that you used to advance the slide, did you suggest the use of a screw to him, and leave it to him to work out the proper form?

A. I did."

No witness but State testified on the subject, and it is further to be remembered that, as already pointed out, the question of State's originality does not arise at all, since defendant made no effort to overcome the *prima facie* presumption contained in the issue of the patent in suit.

What State did is the customary practice and one approved by the Courts. This Court has said:

Agawam vs. Jordan, 74 U. S. 583:

"* * * where a person has discovered an improved principle in a machine, manufacture, or composition of matter, and employs other persons to assist him in carrying out that principle, and they in the course of experiments arising from that employment, make valuable discoveries ancillary to the plan and preconceived design of the employer, such suggested improvements are in general to be regarded as the property of the party who discovered the original improved principle, and may be embodied in his patent as a part of his invention."

This general statement of the law is much broader than necessary to cover the conditions appearing in the present record, but reference is made to the particular authority for the reason that it is a leading case and is frequently cited and relied on. See, for instance, the recent opinion of this Court in *Mineral Separations vs. Hyde*, 242 U. S. 261.

Moreover, the particular features cited by defendant in connection with this contention were early *experimental* forms, all of which were abandoned in the last and commercial embodiment, such for instance as the belt drive of the 4th device, the tongs **S** of sketch 7, the pivotal arrangement of the arms of sketch 9, the first form of screw of sketch 8, and the slide of sketch 7^b. In other words, four or five draftsmen and mechanics, who were helping State, worked out at his direction the specific details of some of the individual parts in the course of his experiments, and all of them were superseded again and again by other experimental parts before the work was finally completed.

State's dates. These dates are clearly fixed and will probably not be disputed. State says (Vol. I, p. 307, Qs. 40, 43) that he started his experiments in 1907, and that a machine was first used for making tire carcasses the latter part of that year, and was put into commercial practice in the spring of 1908. This is corroborated in many ways. Seiberling says (Vol. I, p. 388, Qs. 17 *et seq.*) that State began in 1907, and he refreshes his recollection by the letter he wrote to his brother from Milan (Vol. I, p. 401) of August 12, 1907. He then wrote what he had heard of the Vincent machine and his brother replied by cable to the effect that State was making excellent progress (Vol. I, p. 403, x-Qs. 116, 118). Seiberling also testifies (Vol. I, p. 389, Q. 31) that the machine was operated experimentally in the fall of 1907 and put into the factory in the spring of 1908.

Such an outstanding and important date really requires no extensive corroboration, but the factory ledger (Vol. I, p. 389, Q. 32) shows that the first machine, No. 261, was completed and the order "closed out" April 30, 1910. Again (Vol. I, p. 390, Qs. 33 to 35) Seiberling refreshes his recollection by a letter to his brother, of May

1, 1908, in which he refers to the very satisfactory operation of the machine. There is more to the same effect. A bit of corroboration is found even in the testimony of one of defendant's witnesses. Derry (Vol. I, p. 109, x-Q. 20) said that he was employed at the Goodyear plant "the time they installed that new machine. I saw the first tire put up on that machine." The Goodyear records show (Vol. I, p. 399, x-Q. 103) that Derry's term of employment was from April 13, 1908, to August 5, 1908. In addition, the working drawings for the first machine carry various dates, such as December, 1907, January, 1908, etc. It may be noted generally at this point that an extremely protracted and searching cross-examination failed to shake State's testimony in any important particular.

State's work completed. State testifies (Vol. I, p. 331, Qs. 223 to 229) that after the experimental work was completed in the fall of 1907, he turned the work over to the designer and draftsman. He supervised the drawings in a general way but did not get down to the details. He gave only attention enough to determine that his ideas were being carried into the machine. These working drawings were put in evidence *by defendant* and appear as Defendant's Exhibit X. State was the inventor. When the invention was complete he was through. It was then turned over to others.

First commercial machine. The original machine employed commercially by the Goodyear Company, No. 261, is in evidence as Plaintiff's Exhibit No. 2, but will not be produced in Court. It weighs six tons or more and is in a storage warehouse. Its production is unnecessary, as defendant's expert admits, after having examined it (Vol. I, p. 281, Q. 70), that it "in general form and arrangement was similar to that shown in the State patent, the only notable differences being in the

gearing". As will be subsequently shown, the specific difference is immaterial. For purposes of convenience, plaintiff exhibited in the Court of Appeals below a reduced model, Plaintiff's Exhibit No. 29, Model of State Machine, and also certain photographs, Plaintiff's Exhibit No. 35, Photographs of State Machine, which show practically the same thing.

The machine itself was an exhibit in the earlier litigation and Seiberling testifies (Vol. I, p. 394, Qs. 50 to 56) that it is now in "the same condition as when first constructed and used", and that it was set up and put in operation in precisely the same shape as it was used in the plant. Apparently some improvements were added to this first machine, but he (Vol. I, p. 409, x-Q. 173) had the necessary changes made "in that machine before it was put in evidence in Cleveland, in order to return it to its original condition". There is strong corroboration that it was perfectly restored in the admission of defendant's expert, who says it is substantially the same as the machine of the patent except in the matter of gearing, and even in that minor respect it can be shown that the gearing corresponds to that of the original working drawing, this statement being also based in large part on the admissions of defendant's expert.

Defendant's counsel called for a demonstration of this machine and gave notice of application for an order to that effect, but he waived it, as no such application was ever made. As explained at the time (Vol. I, p. 502), the demonstration was not given because of the existing war conditions. Not only was it extremely difficult to get suitable space in New York, but in addition numerous efforts to get the proper electric power were failures. It was long after defendant's testimony was closed that the necessary power was obtained (Vol. I, p. 584, x-Q. 248). At the time of counsel's notice, the machine had already been dismantled and placed in the storage warehouse,

where it still remains. Moreover, defendant's counsel and expert were given ample opportunity to observe the operation of other Goodyear machines which the evidence shows are like Plaintiff's Exhibit No. 2, and they had actually seen the exhibit machine, although not in operation.

As already mentioned, that particular machine had been successful from the start, and over 150,000 tires were made upon it before it was put in evidence in the earlier litigation. Browne (Vol. I, p. 458, Qs. 38 to 40) testifies that he had seen the machine operated satisfactorily, and at a higher speed than the one given as an example in the State specification. Ray (Vol. I, p. 542, Q. 68) speaks of the tires made upon this exhibit, at a later period when the power was obtained. But ignoring all this cumulative evidence as to the successful operation of the exhibit machine, the only possible point involved might be to demonstrate some deficiency, and this is immaterial. A first machine never works as well as later ones in the light of experience. The Courts have held this many times.*

Original commercial speed. The original speed of the core was quite high and was subsequently reduced as a result of experience and experiment. State explains (Vol. I, p. 330, Qs. 212 to 216) that the rapid speed at the outset arose from the conditions under which he was working, namely, in a close attic in the summer

* This Court, in *Hildreth vs. Mastoras*, 257 U. S. 27, stated as follows:

"It is not necessary, in order to sustain a generic patent, to show that the device is a commercial success. The machine patented may be imperfect in its operation, but if it embodies the generic principle and works, that is, if it actually and mechanically performs, though only in a crude way, the important function by which it makes the substantial change claimed for it in the art, it is enough. (*Telephone Cases*, 126 U. S., 1,535; *Mergenthaler Linotype Co. vs. Press Publishing Company*, 57 Fed. Rep., 502, 505)."

time, where the heat dried and stiffened the fabric, thus necessitating greater speeds to obtain sufficient centrifugal force. It was subsequently learned that such high speed was not necessary when the fabric could be kept in soft and pliable condition.

Defendant's counsel devoted much effort to obtaining statements from State and Seiberling as to the high speed of this original machine No. 261, but both of them refused to guess at it. As already pointed out, State finished his work when he turned it over to the designer and then these matters were attended to by others. He distinctly says (Vol. I, p. 376, x-Qs. 697 to 699) that he did not determine and was not the one to decide upon the high speed. The conditions were substantially the same with Seiberling, who was the principal executive of the Company and not in touch with all the details of construction and development. Seiberling does say that there were experiments with and changes in the speed to get the best commercial results, but he cannot state them, nor the dates when they were made. In any event, the best evidence is the machine itself, which was inspected by defendant's expert. This high speed was 230 R. P. M.

The probable explanation of the matter is that when State was getting better results all the time by increasing the speed, the construction department did not see there was a limit to this advantage and therefore gave the first machine speed of 230 R. P. M. It was perfectly operative at this rate, but other disadvantages crept in. State says in substance that at too high speeds (Vol. I, p. 329, Qs. 206 to 211) it took too much time to overcome the inertia and speed up the heavy core. And likewise it took too long to check the momentum, and they were compelled to use a brake for that purpose. He also says that these high speeds involved a heavy strain on the gearing. Therefore, it was concluded to diminish the speed. By way of illustration, the speed mentioned in the patent is 207

R. P. M. This was apparently an arbitrary cut of ten per cent. from the original 230 R. P. M. Later on, the speed was still further reduced and the Goodyear rate at the present day is between 120 R. P. M. and 150 R. P. M. (Vol. I, p. 55, x-Q. 36), experience having demonstrated that with a range of this extent the full advantages of centrifugal force are obtained with a minimum of the disadvantages mentioned by State. This corresponds closely also to the *desiderata* given by plaintiff's expert.

There is no requirement of law that the very best mode of operating a machine should be stated in the patent. That is invariably determined by experience. Under the authorities, if the patent gives a workable method, it is adequate. Seiberling testifies (Vol. I, p. 394, Qs. 57, 58) that 150,000 tires were built upon the first machine, which seems a fair criterion of practicability.

Alleged defects in rolls. Defendant's counsel seemed to be curious as to whether or not the angularly arranged rolls were capable of tucking the fabric about the bead. As to this, Seiberling testifies (Vol. I, p. 396, Qs. 74 to 76) that in the earlier days the rolls were used in the manner indicated, but later on a separate tool was employed. This was obviously because (Vol. I, p. 397, Qs. 82, 83) the earlier tires were clincher tires and later on more straight-side tires were made. He affirms this at Vol. I, p. 409, x-Qs. 181 to 183. Ray testifies (Vol. I, p. 543, Qs. 70, 71) that the practice of laying the fabric around the beads by the rolls was still in vogue at the Goodyear plant at a time only shortly before he made his deposition. The whole matter is immaterial, since it does not affect the broad invention covered in the State patent.

Again, defendant's counsel apparently argues that springs for pressing the rolls are not as efficient as the weights used by defendant, and that hand pressure is also necessary. State says (Vol. I, p. 330, Qs. 217 to 220) that

the springs alone are adequate and that the hand control is an auxiliary refinement, although not always a necessary one, and he discusses the subject again more at length (Vol. I, p. 376, x-Qs. 700 to 709). Browne testifies (Vol. I, p. 74, x-Qs. 126, 127) that the regular practice he saw on the Goodyear machines is to rely on the springs alone without any supplemental pressure by the operator. But whether or not, the attempt to differentiate defendant's weights from State's springs is futile. Not only are weights and springs recognized mechanical equivalents, but State says so in his patent, and further adds that when he refers to springs he means to include weights also (patent, p. 5, line 125).

Commercial Success.

The authorities have held again and again that commercial success and extensive adoption are the best proofs of merit. Rarely are there found more impressive circumstances of this nature than in the present case. When invention is in doubt success tips the scale in its favor.*

The first machine was efficient from the beginning, as indicated by the fact that 150,000 tires were made on it. Seiberling testifies (Vol. I, p. 390, Qs. 36 *et seq.*) also as to the good quality of the tires. He refers (Vol. I, p. 397,

**Krementz vs. Cottle*, 148 U. S. 556:

"When the other facts in the case leave the question of invention in doubt, the fact that the device has gone into general use and has displaced other devices which had previously been employed for analogous uses, is sufficient to turn the scale in favor of the existence of invention."

Wm. R. Thropp & Sons Co. v. DeLaski & Thropp Co., 226 Fed. 941. In this case the Court said:

"The fact that the art presented problems and that the device of the patent solved them, as well as the fact that the device has gone into general use and has produced new and economical results, speaks for its inventive character. *Smith v. Goodyear Dental Vulcanite Co.*, 93 U. S. 486, 23 L. Ed. 952; *Magowan v. New York Belting Co.*, 141 U. S. 332, 343, 12 Sup. Ct. 71, 35 L. Ed. 781; *Potts v. Creager*, 155 U. S. 597, 609, 15 Sup. Ct. 194, 39 L. Ed. 275."

Qs. 84, 85) to the employment of the double stretch method, and to the production of the stronger carcass having more uniform tension. He says (Vol. I, p. 398, Qs. 86 to 90) that this type of machine in practically its original condition is still in use in the Goodyear factory, although a new and improved form is also being employed there. He says (Vol. I, p. 397, Qs. 77 to 81) that a man with the State machine can make ten times as many tires as by hand. It will be remembered also that the ease and comfort of the operator have been materially increased.

In addition to this (Vol. I, p. 390, Qs. 38 *et seq.*) the machine was subsequently duplicated and delivered to some *fifty* licensees, including such concerns as the United States Rubber Co. and the Fisk Rubber Co. The impressive list of these licensees practically fills pages 392 and 393 of Vol. I of the record, to which reference is directed. Only the desire to save space prevents its inclusion here. It should be noted also that the list includes only the American licensees and *not* the foreign ones.

Substantially the entire Goodyear output of fabric tires has been made upon machines of this type, to the number of twenty millions, and in addition thereto the named licensees have made another forty millions, or sixty millions in all (Vol. I, p. 391, Qs. 41 to 43). These figures (compiled several years ago) are conservative and believed to be an under-estimate, and, moreover, do not include tires made on defendant's infringing machines.

The Court is asked to consider this amazing production. Sixty million tires at an average retail price of \$25 would aggregate a billion and a half of dollars,—a very respectable national debt in pre-war times!

And the licensees continue to use these machines notwithstanding the adverse decision in the sixth circuit. Under their contracts they had the privilege of abandoning their machines in such event, but only one of them (and that one the user of a single machine) took advan-

tage of the provision. The remainder either ignored it entirely, or else entered into a new arrangement with plaintiff whereby they pay half of the regular royalty outright, and deposit the other half in escrow to be turned over to plaintiff in the event of his ultimate success in reinstating the State patent (Vol. I, p. 391, Q. 47; p. 404, x-Qs. 132 to 136). Copies of these license agreements, which specifically refer to the present case, are in evidence as Plaintiff's Exhibit No. 16 (Vol. 2, pp. 143 to 146). They do *not* mention the Seiberling & Stevens patent, as defendant inadvertently states.

It even appears that a number of licenses have been sought and obtained *since* the unfavorable opinion in the sixth circuit. Among these new licensees are the ten concerns listed on page 627 of Vol. I. It would be difficult to find an indication of higher appreciation than this.

Four-fifths of the machines furnished to the licensees were substantially like State's first commercial machine, Plaintiff's Exhibit No. 2 (Vol. I, p. 405, x-Qs. 138, 139). And the new type referred to by Seiberling as in use in the Goodyear factory, and a small proportion of which have been delivered to licensees, are all provided with the same general combination of the State patent (Vol. I, p. 398, Qs. 91 to 93), although in connection with sundry improvements. For instance (Qs. 94 *et seq.*), air pressure instead of spring pressure is applied to the stitcher arms, as well as automatic means for releasing this pressure at the proper point; there are automatic means for separating the rolls; there is a pneumatic bead setter, an electric drive control, etc., etc. None of these additions affect the questions at bar. The proofs show (Vol. I, p. 412, Rd-Qs. 201, 202) that all of the elements covered by the State claims in suit are present in the machines furnished to the licensees. This is confirmed by Trogner (Vol. I, p. 620 *et seq.*), who details specifically the construction of these machines, and from whom

it appears that the only modifications (and some of these were subsequently dropped) need not be considered.

There are always alterations and supposed improvements in every successful apparatus. They will be found in defendant's machine as well as in the Goodyear machine. Authorities are abundant to the effect that improvement does not avert infringement.*

The Improved Product.

That State's tires were an improvement on the hand-spun variety is established beyond question. The record shows (1) that the hand-spun tires were poor for a variety of reasons, as by the previously discussed testimony of defendant's witnesses, Drach, Bittaker, Koplin, Heller, Derry, Gregg, etc.; (2) that State's tires were good, as by the testimony of Seiberling and State; and (3) that the reason for the difference was that the latter possessed the balanced tension of the double stretch system, arising from State's interjection of radial stretch. These three propositions cannot be disputed.

The *fact* of superiority being established, plaintiff has endeavored also to determine its *extent* and to express it mathematically in an approximate percentage. To this end two different sets of comparative tests were conducted, and although under totally different conditions, nevertheless with striking similarity in results.

These tests were made by Mr. Ray, who is a mechanical engineer and machine designer and had devoted much time to the study of tires and tire-making. They were made both for the purpose of determining the degree of

* Walker on Patents, 5 Ed., p. 463, states as a general rule that "a defendant's machine may be better than that covered by the patent in suit and may be an improvement upon it; if that superiority resulted from some addition to the latter it will have no tendency to avoid infringement, and it matters not that the addition or improvement is patentable or patented". See the many cases cited.

superiority and also to verify his theory that the hand-made tire must be inferior. On the latter point he testifies as to the first set of tests (Vol. I, p. 541) :

"Q. 64. Will you state under what circumstances and for what purpose?"

A. In connection with the various studies which I had made regarding the strength of tires, it seemed plain to me that the hand-made tire would not be as strong as the machine-made tire, and in order to determine whether or not my theory in this regard was correct, I had constructed a number of hand-made tires and a number of machine-made tires, and I burst these tires in an exactly similar manner to that already described, and found that my theory was verified."

The tests were *ex parte* and an objection has been made, although for the first time in defendant's brief, on the ground that defendant was not invited to be present. Such objection would go to the weight and not to the admissibility of the evidence. Walker, Sec. 498, page 563, states the general rule, and it will be observed in the several authorities that the question was frequently complicated by other considerations of credibility, importance, or the like. Here the evidence is merely explanatory of a principal fact already proved. Moreover, no proper objection was made. Defendant's counsel said (Vol. I, p. 528) :

"I object to any testimony as to the tests mentioned, on the ground that the same is immaterial, irrelevant and incompetent."

There is specific authority to the effect that this form of general objection is not adequate to embrace one as to the *ex parte* character of a test. See *Hoskins Mfg. Co. vs. General Electric Co.* (Ill.), 212 Fed. 422, 432; affirmed by 7th C. C. A. in 224 Fed. 464.

The testimony is well within the rule given in *Wigmore on Evidence*, Vol. II, p. 1725, § 1385:

"Of late years, the fallacious suggestion has sometimes been made by unreflecting counsel that the rule requiring an opportunity of cross-examination applies to forbid the use of a diagram or model or map, or of a chemical analysis or other expert investigation, prepared or made out of court without notice to the other party. The suggestion is erroneous, for the reason that there *is* afforded in such cases the required opportunity of cross-examination, namely, when the witness who has made the model or the analysis takes the stand at the trial to testify to the results of his work. No more can be demanded. The map or model or analysis is not in itself testimony (*ante*, § 793); it is nothing until adopted by a competent witness as a part of his testimony and a mode of communication."

Defendant's counsel *did avail himself of the opportunity to cross-examine* the witnesses as to the tests at great length, as for instance, Ray in x-Qs. 140 to 236, Vol. I, pp. 569 *et seq.* Not only did he fail to object to the direct, but he conducted his extensive cross without reservation. He did not ask for a repetition of the tests. He did not ask for the privilege of making similar tests himself. He did not ask for surrebuttal, which is almost invariably granted in patent cases.

If defendant ever had the right to object, it was clearly forfeited. And in any event, the evidence is more a matter of interest than one of importance. The controlling feature is the independently proved existence of superiority.

Preparing the tires. Ray details at length (Vol. I, pp. 528 *et seq.*) just what he did. Mackey made the hand spun tires, and Shaw the tires on the Goodyear commercial machine. These carcasses were otherwise the

same in every respect. He used the same number of plies, the same materials, the same beads, the same chafing strips, the same rubber covering, etc. However, proof of their similarity does not depend upon testimony, as the tires themselves were introduced in evidence, Plaintiff's Exhibit No. 18, Hand Spun Tires, and Plaintiff's Exhibit No. 19, Machine Made Tires. Any point of difference would be readily apparent. He saw both Mackey and Shaw make the tires and saw them finished. Both sets were subjected to the same vulcanizing treatment. At the Goodyear plant a double-cure system is employed, the first step being to cure the carcass by itself, and the second step to cure it again after the tread has been applied. In this instance, as the tread was omitted, he directed a single cure of longer duration (Q. 19). He says (Qs. 20 and 21) that the reason the tread was omitted was because the only thing of interest was the strength of the carcass and the tread had no bearing on this.

In order to approximate closely to the conditions set up by defendant, who relies largely on the hand practice in the Diamond plant, an employé from that plant, Mackey, was selected to spin the tires. Mackey was produced as a witness and his deposition begins at page 414, Vol. I. He tells of his Goodrich and Diamond experience; of the official and authorized method there, viz., the sawtooth method; and of his own unauthorized practice of the hand spinning method. He tells (Q. 20) about making the tires, Exhibit No. 18; of his introduction to the Goodyear plant and his being requested to make tires by the hand spinning method as he did (Q. 24) at the Diamond plant; and (Q. 25) that counsel instructed him to make them of as good quality as possible. He started in and made a few experimental tires first to be sure that his hand had not lost its cunning; and then he made a set of ten tires from inappropriate

material, these affording him further practice. Then (Q. 29) he started in with the proper material and made another set of ten tires, Plaintiff's Exhibit No. 18, which he says (Q. 30) were made by the hand spinning method in the way he formerly made them in the Diamond plant, and with as much skill and ability as he was able to exert. Ray testifies (Vol. I, p. 532, Qs. 29, 30) that he observed Mackey closely and that he "was a very skillful tire-maker, and the work which he did on these tires was very carefully and perfectly done". In other words, all the conditions were favorable to the hand-made tires, as no such skill and care could have been regularly exercised in the earlier practice.

Ray produces (Vol. I, p. 530, Qs. 22 *et seq.*) the records or charts relating to the curing of these tires, Plaintiff's Exhibit No. 17 (Vol. 2, pp. 149, 151), and marks thereon the lines respectively referring to the two sets of tires, using "M" (Mackey's initial) on the hand-made tires.

The machine-made tires (Vol. I, p. 533, Qs. 32 *et seq.*) were made on one of the old State machines in the customary manner, and there was nothing unusual or extraordinary in their manufacture. The tires in this exhibit were marked with an S (Shaw's initial). Ray repeats (Q. 35) that the two sets of tires were exactly alike except as to the different modes of laying the fabric on the sides of the core, and were finished in the same way.

Bedell (Vol. I, p. 597 *et seq.*) testifies that he produced and delivered the same kind of material to both Mackey and Shaw, and that after the carcasses had been formed and finished, they were delivered to the curing room. He affirms the distinguishing letters, M on the Mackey tires, and S on the Shaw tires. Rowles, head inspector on curing (p. 606), speaks of receiving these two sets of tires marked "M" and "S" respectively, and of their being subjected to a single cure. He also identi-

fies the charts. However, his principal experience was in the double and not the single-cure process.

Therefore, Price (Vol. I, p. 614), of the technical service division, was called and testified that according to his tests the hand-made tires marked "M" (Plff.'s Ex. No. 18) were properly cured. And he states further that the tires marked "S" (Plff.'s Ex. 19) were properly cured. Referring to the curing charts, he says (Q. 10) that the two sets of tires M and S were subjected to a single cure and that "these charts indicate that the heat treatment thereby recorded was the proper curing or vulcanizing treatment for a single cure in connection with 34-4 tires". He was questioned as to a slight jog or depression in one of the lines on the chart, but says it "would not affect to any extent the efficiency of the particular cure". He had already stated that the exhibit tires were properly cured.

The actual test. Ray next describes (Vol. I, p. 534, Qs. 40 *et seq.*) the comparative test to determine the respective strength of the two sets of tires, which was the application of hydraulic pressure internally, the pressure required to burst each tire being observed and recorded. He selected this hydraulic test because it was searching and seemed the only one which would give a fair comparison of relative strength, and because it subjected the tires to stresses of a nature similar to those they have to withstand in service. He (Q. 42) regarded it as superior to the customary road test, because the latter had too many different and uncontrollable conditions, and moreover it would take too long. Further, he states that a tire usually fails finally by bursting. The apparatus he employed, and his methods of observation are described at length in Qs. 47 to 53, and need not be specially discussed herein.

Ray gives (Q. 54) a table of the respective pressures at which the hand-spun tires burst, it being noted that the

average of these pressures is 388.1 pounds. Similarly (Q. 55) he gives a table of the pressures at which the machine-made tires burst, the average being 435.75. Notwithstanding the very favorable conditions surrounding the production of the hand-made tires, it required (Q. 58) 12.3% more pressure to burst those made by machine. But this is not all, since (Qs. 59 to 61) in service the pressure to which such tires are subjected is 75 pounds, and this should be subtracted from each average to obtain the safety margin, which raises the percentage to 15.2%. Again (Q. 62), even the higher safety margin is not to be taken as a strict criterion in calculating the greater longevity of machine-made tires. Ray points out that the life of the machine-made tires would be much greater than that indicated by the mathematical figures, and gives his reasons at length.

Ray made still another test with substantially parallel results (Qs. 63 to 67) at the very outset, when to verify his theories, he procured a number of hand-made tires and a number of machine-made tires and burst them in a similar manner. This he did to determine whether or not it would be worth while to obtain a Diamond operator and make a more complete test. In this preliminary essay Shaw made both sets of tires, the machine-made tires bursting at 429.5 and the handspun tires at 383.6, the difference of margin of safety being again in the neighborhood of 15%. In other words, he obtained substantially the same results in both instances, although conducted at different times and under different conditions. The result of these comparisons is striking and positively confirms the theoretical differences.

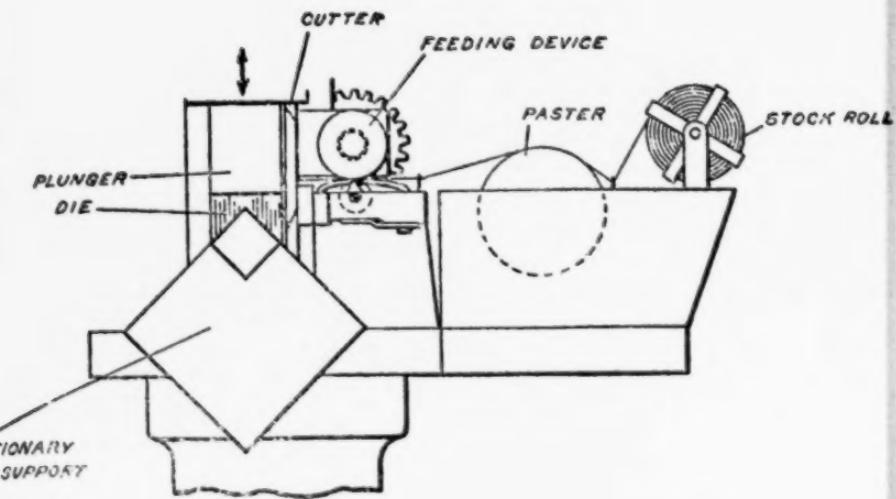
Hand Spun Tires do not Embody Double Stretch. Defendant, at several places in its brief, refers to the Mackey hand-spun tires as embodying the

feature of double stretch. The tires themselves, however, do not support the contention, but on the contrary, show that they are essentially in the single-stretch class. If there are any radial diamonds present at all, they will be found only in that portion of the fabric wrapped around the beads in the regular Goodyear finishing operation which was not performed by Mackey (Vol. I, p. 424, x-Q. 86).

Converting Hand Method into Machine.

It is believed that the Court has now arrived at the crux of this case. Defendant claims in effect that hand spinning anticipates, or at any rate negatives, the invention of State's patent. Plaintiff views it as a part of the proofs indicating the obstacles which State's research and experiments finally overcame. *What he did was to convert an ineffective, uncertain, imperfect hand operation into an effective, certain, perfected machine. He transformed a low-grade and irregular tire with unbalanced tension into a high-grade and uniform tire with balanced tension. And there was something more than this, since he substituted the double stretch system for the single stretch system.* In hand spinning, radial stretch was practically impossible, or else, if present at all, in such slight degree as to be negligible. The Courts, including this Court, have often found invention in parallel circumstances.

The leading case is *Hobbs vs. Beach*, 180 U. S. 383, involving a machine invented by Beach, which was the first to paste paper strips on the edges of boxes to stay or strengthen them, this operation having previously been performed by hand. It was the first to make a stayed box of this type by machinery. To make the simplicity of the mechanism clearer we append herewith a view taken from the Beach patent. The Beach machine



BEACH REISSUED PATENT No.11,167.

HOBBS vs BEACH 180 U.S. PAGE 38

embodied a stock roller carrying a roll of paper or fabric to be used for the stay strips, a paste-applying roller, over which the strip passes to have one of its faces supplied with adhesive material, a feeding mechanism for drawing the strip off the stock roller and over the paste-applying roller and for placing it in proper position over the box corner, a cutter for severing the continuous strip into stay-strips of suitable width, as well as a pair of opposing clamping dies on one of which the box is supported and the other of which acts, when it comes down, to shape and clamp and press the stay tightly in position upon the corner and thus to paste it permanently thereto.

Compare this comparatively simple subject matter with that embodied in the State machine, wherein, in addition to the provision of means for securing uniformity and precision of action, he embodied also his discovery of high speed, centrifugal force, and radial stretch. Nor

must it be forgotten that the Beach machine was not completely automatic, but pasted only one corner at a time, no instrumentality being provided to turn the box to its new position on the lower clamping die after each shaping, compressing and pasting operation. In the State machine, the mechanism for advancing the rolls is similarly controlled by hand. The Court said (p. 386) :

"Prior to the Beach invention, the work of thus strengthening the corners of paper boxes by these adhesive strips had always been performed in a tedious and irregular way by hand."

And again (p. 393) :

"In passing upon the question of novelty we feel at liberty to consider the fact that the Beach machine and its congeners have completely supplanted the former method of applying strips by hand; that no manufacturer can successfully compete for the trade without adopting such machine; that it not only applies these strips with much greater rapidity than is possible by hand, but the work done is stronger, cheaper, cleaner, and more uniform; that the machine attaches the strip more rigidly about the corner, and that, by reason of its greater compression, forces out the moisture and dries the box for immediate use; that there is also a saving of material by cutting the strips of the proper length instead of tearing them, and that, by reason of the greater compression, heavier and stronger material may be employed than was possible when the work was done by hand. We find no difficulty in holding that the first three claims of this patent were not anticipated by any prior devices."

This authority has been frequently followed by other Courts.

And there are other cases in which this Court has affirmed patentability over earlier hand methods. A very

recent one is *Hildreth vs. Mastoras*, 257 U. S. 27, wherein Chief Justice Taft says as follows:

"The history of the art shows that Dickinson took an important but long delayed and therefore not obvious step from the pulling of candy by two hands guided by a human mind and will to the performance of the same function by machine. The ultimate effect of this step with the mechanical or patentable improvements of his device was to make candy pulling more sanitary, to reduce its cost to one-tenth of what it had been before him, and to enlarge the field of the art. He was therefore a pioneer."

There are other cases to the same effect, although in none of them is the parallelism closer than in *Hobbs vs. Beach*.

This doctrine is so well established that defendant is forced to acknowledge it. On page 13 of its brief, it says:

"In order to avoid any misunderstanding, it should be stated at the outset that Defendant does not contend that a patent cannot be granted for a machine which carries out a method or process previously followed by hand. Indeed, some of the most valuable patents are in this class (*Hildreth vs. Mastoras*, 257 U. S. 27)."

The Court of Appeals below, in referring to this subject, stated as follows:

"In this state of the art, in 1907 State undertook to adapt the other or hand roll method of making a double stretched tire to machinery. Certain elements entering into that problem were of course well known. That fact of the desirability of the initial circumferential stretch of the tread portion into circumferential diamonds, was in use; the lessening of stretch resulting in squares on the side of the shoe was a well known practice, as was also the radial stretch for the inner portion of the shoe,

which turned the square of the fabric into a diamond shape at right angles with the diamonds of the initial or tread stretch. So also the use of a hand or spinning roll was well known, and the problem involved, as in most machine improvements, was to take these well understood and recognized processes which were done by hand and directed by skill, and do the same work by machinery. This problem State met, and for the first time successfully solved in a machine-made tire of the double stretch character indicated. The machine he produced was at once recognized. It went into instant use. On such machines millions of tires have been built, and large numbers of companies have taken out licenses under the patent."

As before pointed out, this matter was not touched upon in the *Firestone* case, and hence there is nothing in the opinion of the Court of Appeals for the Sixth Circuit bearing upon it.

Penn vs. Conroy Distinguished. In connection with his apparent holding that State's invention was anticipated by hand spinning, Judge Bodine of the trial Court said:

"If further authority is necessary see *Conroy vs. Penn*, 115 Fed. 421, affirmed 159 Fed. 943."

This involves an obvious confusion, no doubt arising from defendant's fallacious argument that State's claims as modified by the disclaimer in effect cover a method rather than a machine, with the result that a holding intended to apply to the first statutory class of invention (*i. e.*, "art") was construed by the Court to attach to the second statutory class (*i. e.*, "machine"). State's patent is unquestionably in the latter category. True, his claims set forth *a mode of operation* of the combined elements, but this is entirely proper, as will be seen from the authorities cited later on under the heading "*New mode*

of operation", page 172 *et seq.* Holdings and doctrine relating to method patents do not touch the present situation.

In *Penn vs. Onroy*, two patents were involved, one for a method or "art", and the other for a "machine". The invention related to the ornamentation of glass by chipping or scalloping. In the earlier practice this was effected by a hand operated tool. In the machine, the chipping pins were mounted on a drum or carrier and means were provided for holding the glass to be acted on. The method claim was as follows:

"As an improvement in the art of shaping the edges of glass articles, the method herein described which consists in removing by blows at successive points closely adjacent to the edge, the edge and a portion of the opposite side of the article in pieces approximately uniform in quantity, substantially as set forth."

This was invalidated on the prior hand practice. The machine claim was as follows:

"In a machine for shaping the edges of glass articles, the combination of a carrier having a series of two or more pins secured to the carrier and spaced in the direction and transversely of the path of movement of the carrier so as to operate successively and at different points on the article, means for moving the carrier and a rest or bearing arranged to support the article adjacent to the edges to be operated on, substantially as set forth."

This claim was held valid and infringed. The Court said:

"The machine because of the rapid and uniform character of its work has supplanted the old hand method. We deem it unnecessary to discuss in detail the prior art, since it does not disclose anything which can properly be considered as an anticipation of the complainant's machine patent. *He was the first to devise a practical machine for decorating glass.*"

It is submitted that the general finding makes a clear distinction between machine patents and method patents when considered in connection with earlier hand practice, and one entirely in favor of plaintiff here. State's patent is for a machine. In relying on this authority, the trial Court erroneously assumed it to be for a method.

The State Patent.

The patent in suit presents clearly the State mechanism previously described. Plaintiff's expert (Vol. I, Q. 8, pp. 27 to 31) first describes the necessary changes in the reticulations of the fabric, so that when laid on the core, there will be diamonds in the tread portion with their long axes circumferential, which diamonds merge into squares at the median line, which squares in turn merge into diamonds with their long axes radial in the bead zone, all as illustrated in the previous diagrams. These changes are effected by the double stretch system, wherein by suitable tension devices the fabric is first applied to the core with *circumferential* stretch, and then the unattached skirts are applied to the sides of the core by forming rolls with *radial* stretch. While most of the claims in suit refer more particularly to the side-forming action of the rolls on the skirt, it is thought desirable to describe briefly the devices whereby the fabric is first applied to the core. For that purpose, Figs. 2 and 7 of the drawings are here reproduced.

The fabric from the supply or stock roll passes around rollers, one of which is a tension roller to which tension is applied by the mechanism illustrated in Fig. 7, and the leading end of the fabric is cemented to the core, as shown in Fig. 2. This reference to the tension devices is adequate for the present and later they will be taken up more at length.

W. C. STATE.

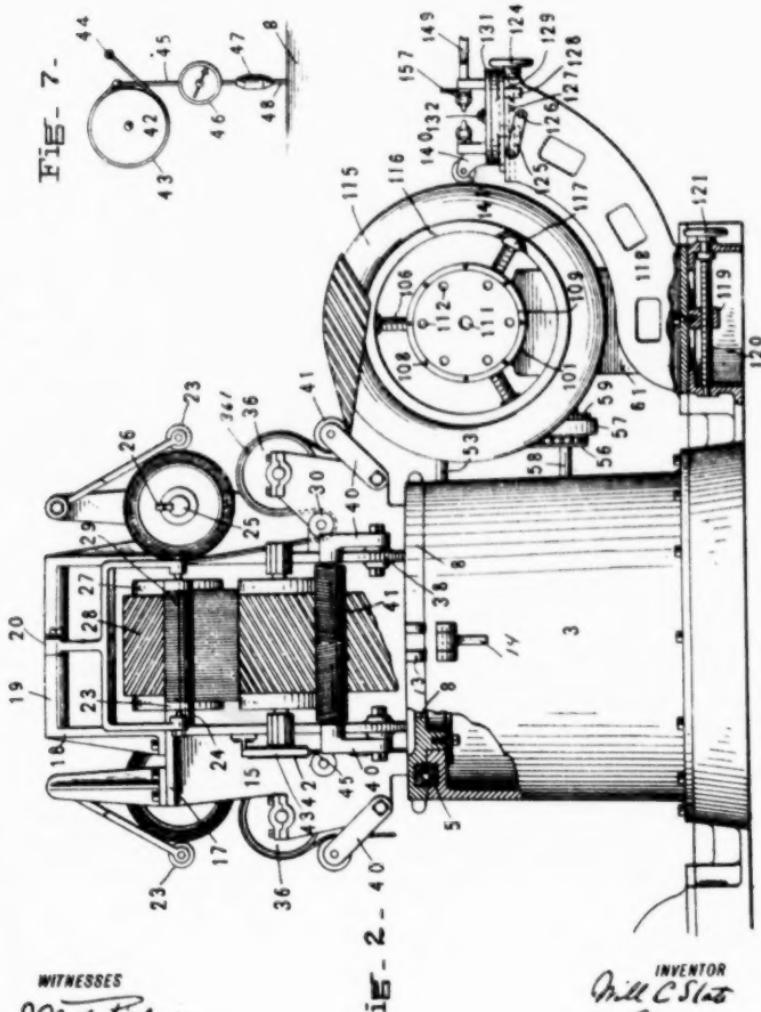
PNEUMATIC TIRE SHOE MANUFACTURING MACHINE.

APPLICATION FILED MAR. 29, 1899

Patented Nov. 30, 1909

941,962.

CHURCH—STREET 1.



WITNESSES

W. Leydig

Fig.

INVENTOR
Mill C State
BY Gene Roney
ATTORNEYS



The core is then slowly rotated, thereby drawing off the fabric under tension from the supply roll and giving the desired uniform stretch to its middle portion. The beginning of this operation is shown in the drawing. The specification says:

"I apply the canvas to the power-driven ring-core while this is moving quite slowly, say at six revolutions a minute" (p. 2, lines 1 to 4).

The rotation of the core is continued until a layer of fabric has passed completely about it. It is then stopped and the fabric is severed by the workman, who fastens its last end so as to overlap slightly the leading edge, the rubber compound with which it is impregnated ensuring its adhesion. At this stage the fabric has been circumferentially stretched so as to conform it to the tread zone of the core, but its margins or skirt portions are unattached and in a loose and baggy condition.

The machine is provided with speed changing mechanism, which will be examined later on. This mechanism is brought into play and the ring-core is rotated at high speed during the subsequent action. In this connection the specification says:

"* * * I have discovered, however, that it is not only possible but highly desirable to let the smoothing- and spinning-rolls operate upon the ring-core while this is moving at a much higher speed, say at two hundred and seven turns a minute. By this means the machine not only does more work in a given time but it does better work" (p. 2, lines 4 to 11).

As before discussed, this speed of 207 R. P. M. is given merely by way of illustration. The speed of the original machine, Plaintiff's Exhibit No. 2, was 230 R. P. M., which was cut ten per cent. before the application was filed, and later on was diminished still further. The

speed indicated in the specification was quite sufficient for the purpose. Under the law, all that is required is something practicable, and it is not a defect, if subsequent experience shows that something else is better. The preferred commercial speed at the present day is between 120 R. P. M. and 150 R. P. M.

Tread Roll. Before discussing the spinning rolls, reference is made to the tread roll 141, which is shown as pressing the already stretched portion of the fabric on the tread zone of the core. The purpose of the tread roll was to bear on the fabric "which actually forms the tire tread to thoroughly smooth it and shape it to the core" (p. 5, lines 58 to 60). It will be seen from this description that the tread roll is merely auxiliary to the original circumferential stretching. The testimony shows it is often omitted. The present case is not concerned with it. It was a part of the earlier litigation. But the claims embodying it have been since eliminated by disclaimer.

Forming Rolls. The next topic is that involved in the claims here in suit, namely, the forming- or spinning-rolls which apply and shape the unattached skirts of the fabric to the sides of the core, while the latter is rotating at its fast speed. It may be here noted that this description applies equally well to defendant's machine, wherein the action of the forming-rolls is the same as that of the rolls of the State patent. Such differences as may exist do not affect the present subject matter, as will be later pointed out.

These rolls are best shown in Figs. 9, 12b and 12c, the latter two figures being here reproduced. There is a pair of these rolls which simultaneously act upon opposite sides of the core and upon the respective skirts of the fabric. They are supported by a sliding carriage which is movable radially with respect to the rotating core. This carriage is accurately guided and is moved inwardly by a

State Patent

Fig. 12^b

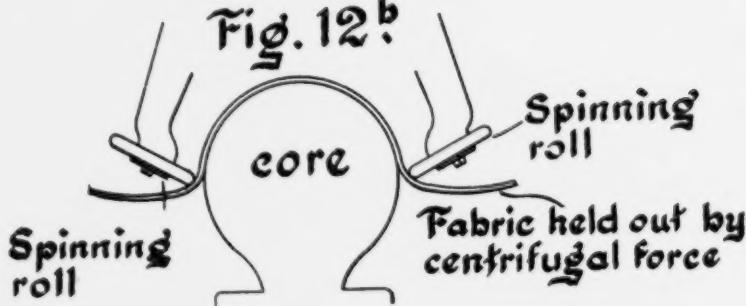
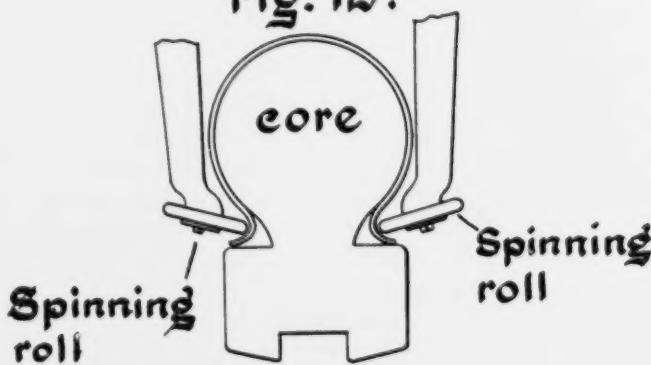
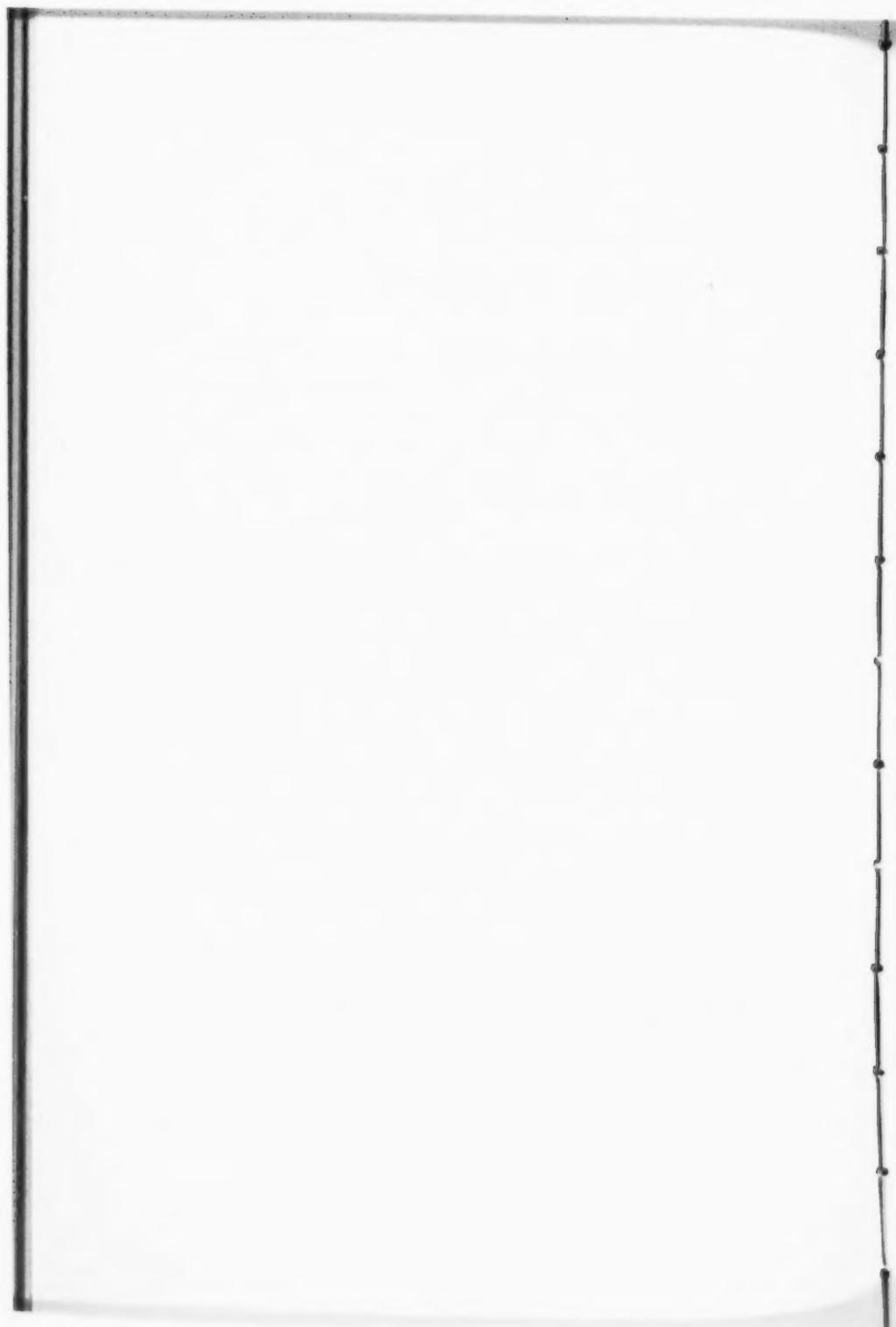


Fig. 12^c





screw feed so that the forming- or spinning-rolls are also gradually fed inwardly as the core rotates. Also, each forming- or spinning-roll is pressed toward the core so as to press forcibly upon the portion of the fabric which it bears against. This arrangement has been already described in connection with State's experiments. The carriage is shown at 123 in Fig. 6, and is guided mechanically to slide radially with respect to the core. It is gradually advanced by a feed screw controlled by the hand wheel 124. Mounted upon this slide, is the rotatable head or turret (Fig. 9), which not only carries the forming- or spinning-rolls, but also the tread roll, the bead-applying rolls, and the trimming cutters. By turning the turret, any one of this set of tools may be brought into co-action with the core. However, the turret and these other tools need not be considered. The only tools here involved are the two forming- or spinning-rolls, and only when they have been located in proper relation to the rotating core so that they may be advanced along its sides.

Each of the rolls 147 is rotatably mounted on the end of a pivoted lever, and each of these levers is acted upon by a spring 145 which presses the roll against the fabric on the core, in the manner already described in the review of State's experiments. As the function of these springs seems to loom large in defendant's mind, it is believed proper to quote at length from the specification concerning them:

“* * * The spinning-rolls are also shown as spring-pressed toward the plane of the ring-core by springs 145, here shown, diagrammatically, as leaf springs although, in practice, strong spiral springs will be used” (p. 5, lines 108 to 113).

The specification further states that weights can be substituted for the springs:

“* * * And it is of course understood that there may be substituted for the springs and as an

equivalent therefor the more cumbersome device of a weight constantly tending to force the spinning-rolls, with considerable pressure, toward the ring-core" (p. 5, lines 121 to 127).

Also, the spinning-rolls may be pressed toward the core in other ways:

"* * * In a broader aspect of my invention, however, I may employ mechanical instrumentalities, not the hands of the operator, other than springs or weights for pressing the spinning-rolls laterally against the ring-core. I shall, then, use the term 'power-pressed' to cover generally not only springs and weights but other mechanical instrumentalities for pressing the spinning-rolls against the ring-core" (p. 6, line 2).

In addition, as shown in the drawings, the plane of rotation of each roll is not perpendicular to the plane of rotation of the ring-core, but is at a receding angle thereto:

"* * * It will be noted finally that I mount the spinning-rolls with their plane not at a right angle to but to recede at an acute angle from the plane of the ring-core. The fact is when the ring-core is rotating at high-speed, the centrifugal force tends to throw the fabric out at a right angle from the core-plane and unless the roller recedes in the manner shown, the fabric will become entangled with it" (p. 6, lines 33 to 42).

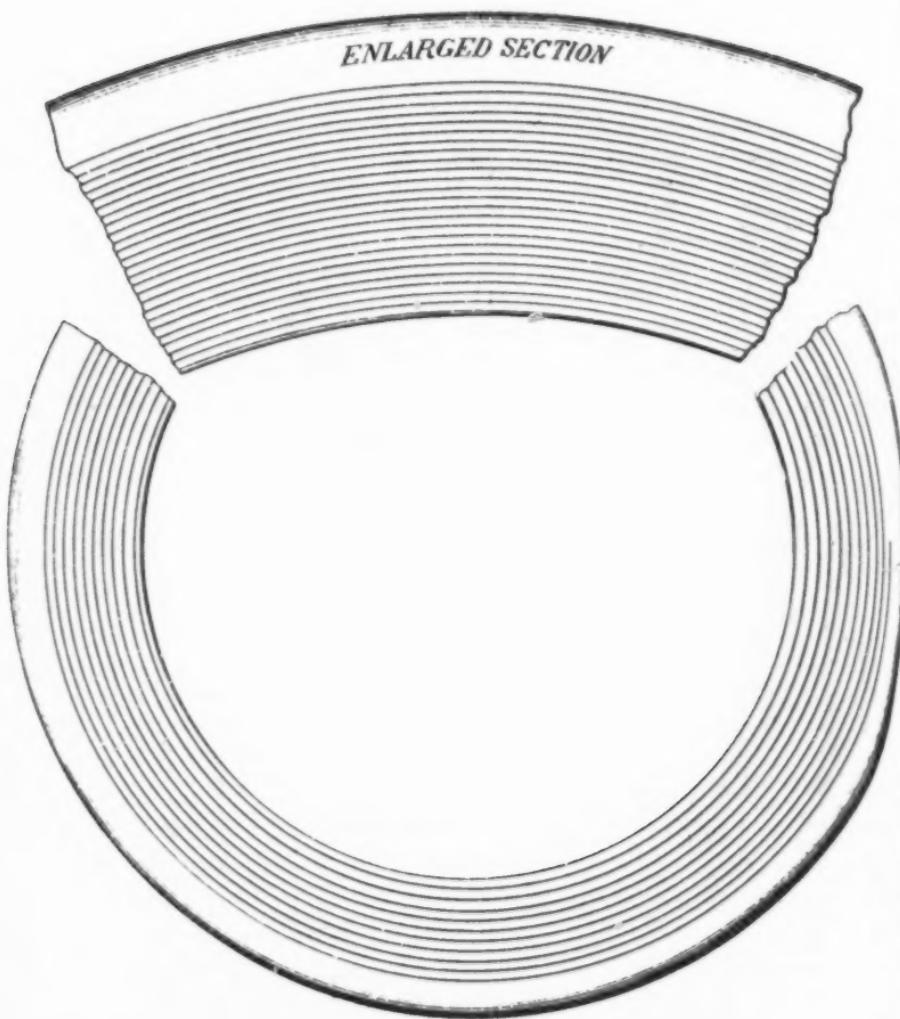
As shown in the drawings, each roll has a rounded working edge:

"* * * While I have shown these spinning-rolls as disk-shaped throughout, it will naturally be understood that the disk-like or narrow character of the rolls is only essential at the periphery, which is rounded and not sharp so as not to cut the fabric" (p. 6, lines 17 to 23).



STATE'S SPIRAL PATH

ENLARGED SECTION



Action of Rolls. The effect of the high speed of the core is to throw out the skirts of the fabric by centrifugal force, somewhat as indicated in Fig. 12b. The result is that the skirts are projected outwardly in a stiff and smooth condition, thus eliminating any tendency to fold or wrinkle. The rolls are then brought into action and each roll initially presses and acts upon the hinge of the corresponding skirt. That is to say, at each edge of the already attached tread portion, the skirt is thrown out by centrifugal force at the line where the adherence of the fabric to the core ceases, and this line constitutes a hinge on which the outstanding skirt turns. It is at this hinge line that the effective action of the roll takes place. Each roll presses against the fabric at this line, thus forcing that particular portion against the core and causing it to adhere thereto (Vol. I, p. 37).

As the core rapidly rotates, the rolls are fed gradually inward with the result that each of them traces a spiral path with respect to the core and the fabric thereon, as shown in Plaintiff's Exhibit No. 12, here reproduced. The successive convolutions of this spiral are brought closely together by the small progressive advance of the spinning-rolls, so that each roll can act successively only upon small or elemental areas. *The uniform and close arrangement of the successive convolutions was impossible in hand spinning, and is secured by State's mechanical devices which prevent slipping and jumping.* In practice, the distance is about one-eighth of an inch, and these small areas are folded down successively until the entire skirts are laid smoothly, uniformly and accurately against the sides of the core (Vol. I, p. 38).

During this folding action, the centrifugal force acting in opposition to the inward pressure of the spinning-rolls maintains the unattached portions of the skirts smooth and wrinkle-free, with the result that the formation of wrinkles in the applied fabric is prevented.

Plaintiff's expert also points out (Vol. I, p. 65, x-Qs. 88, 89) that the roll does two things simultaneously, one portion of its rounded edge pressing the fabric against the core, and at another portion bearing upon that part of the skirt which is held outwardly by centrifugal force. It is the frictional engagement of the outflung skirt with and about the rounded edge of the roll that affords the necessary resistance to secure the radial stretch.

In view of the fact that the main movement of the roll is predominantly circumferential, the radial component being relatively small, it might seem that the effect would be to stretch the fabric circumferentially and not radially (just the opposite of what is desired); but the fact is that the fabric is stretched radially and not circumferentially, and this is due to the frictional resistance of the outflung skirt to the advancing roll. That is to say, the result secured is that indicated in the diagram "Fabric Shaped to Core", wherein at the bead zone the reticulations are converted into radial diamonds or lozenges by the radial stretch.

As a matter of convenience, and particularly to emphasize the distinction over the single stretch system, is next given the following concise résumé of the characteristic features of the State mode of action (Browne, Vol. I, p. 38).

1. *Centrifugal force* due to the high speed which holds the skirt away from the core in stiff, smooth and wrinkle-free condition and under tension, the resistance being sufficient to produce radial stretch as the roll advances.

2. *The progressive advance* of the roll which establishes a base or hinging line along one portion of its spiral path, and then a new base or hinging line along the next portion of the spiral, and so on.

3. *The hinging or folding action* over small areas of the fabric so that it contracts circumferentially

and is laid down wrinkle-free along the zone of the narrow advance.

4. *The cementing or adhesive action* of the rubber which holds the fabric firmly after it is pressed against the core.

The ultimate effect is the re-arrangement of the threads or cords of the fabric so that all its portions are smoothly attached to the core (Browne, Vol. I, p. 39). The mode of operation and the elements producing it are the outstanding features of State's invention. Also, they are present in defendant's structure. And finally, they constitute the subject matter of the claims in suit.

What the Court of Appeals for the Third Circuit Found to be State's Invention.

In reading the opinion of the Court of Appeals for the Third Circuit, rendered in this case, it should be borne in mind that Judge Buffington, who wrote the opinion, had before him this very full record in which two distinct prior hand practices are discussed, namely, first, that which has been referred to as the double-stretch saw-tooth method, in which the fabric is first stretched around the circumference of the core and the core is then rotated, step by step, as the operator with one hand pulls out or stretches the fabric laterally and radially while, with the other hand, he applies a hand-held roll to the skirt of the fabric in a zig-zag or saw-tooth course, so as to lay the fabric against the core and produce a radial stretch or elongation of the meshes of the fabric, as more particularly hereinbefore described (*ante*, p. 8); and, secondly, the so-called hand-spinning method, pure and simple, in which the fabric is first stretched around the circumference of the core, the core then rotated or spun, by

one hand of the operator, while a spinning roll, held in the operator's other hand, is pressed against the fabric to lay it against the sides of the core; the product, in this instance, showing little, if any, radial elongation of the meshes of the fabric (*ante*, p. 17).

When Judge Buffington, therefore, said that

"tires embodying these two features of *double stretch* and *roll-spinning fastening*, were, before the patent to State, here in question, hand made",

he was, of course, stating a fact, and had both prior hand practices in mind.

After quoting Judge Denison's exposition of the common or saw-tooth hand practice, Judge Buffington next refers to the Seiberling and Stevens machine as an attempt to make a machine-made product, which was a commercial failure, and then approaches the State invention, first reciting the results attained by State, and afterward referring to the combination of mechanism by which those results are accomplished.

He says:

"In this state of the art, in 1907 State undertook to adapt the other or hand roll method of making a double stretched tire to machinery. Certain elements entering into that problem were of course well known. The fact of the desirability of the initial circumferential stretch of the tread portion into circumferential diamonds, was in use; the lessening of stretch resulting in squares on the side of the shoe was a well known practice, as was also the radial stretch for the inner portion of the shoe, which turned the square of the fabric into a diamond shape at right angles with the diamonds of the initial or tread stretch. So also the use of a hand or spinning roll was well known, and the problem involved, as in most machine improvements, was to take these well understood and recognized processes which were done by hand and directed by skill, and do the same work by machinery. This problem State met, and for the

first time successfully solved in a machine-made tire of the double stretch character indicated. The machine he produced was at once recognized. It went into instant use. On such machines millions of tires have been built, and large numbers of companies have taken out licenses under the patent."

Still continuing to characterize the State invention by its functions and results, he says:

"Analyzing such machine, we note that in the tread circumference there is a low speed, and we there start with a circumferential stretch and a circumferential diamond-shaped interstice. Its separate processes and their product do not end and are not completed at any given point, but as each distinct process and mode of operation begins and carries on it correspondingly modifies the product, and as the machine functions in its entirety, there is a gradual and progressive change in the continuous operation and in the progressing and changing product, which gradually, uniformly, evenly and continuously changes the product of the machine from the initial circumferential stretch and the circumferential headed diamond-shaped interstices into a gradual approach to the normal square with its substantially unstretched fabric into which the product gradually shapes itself up to the side or median line. But the process does not stop here, for there is still a continual shading, this time from the square of the median zone of the tire side into the radial circumferential stretch of the bead or inner portion of the tire, and a gradual departure from the unstretched square of the median line to the radially stretched and radially pointed diamond shaped interstices of the bead or inner portion. Far from being separated, isolated zone processes, there is a gradual and uniform, and indeed an unbroken spiral sequence caused by the rapid rotation of the core and the consequent exercise of centrifugal force on the covering material, by which it is automatically gradually stretched radially and by the joint action of such centrifugal,

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radial stretch, and the spinning rolls, the square of the median zone progressively shades into the radial diamond shaped interstices of the bead or inner zone of the shoe.

In a way we have anticipated what State's *machine* really is, by thus describing its *results*. But such statement should be initially made, for the crux and dominating *functional feature* of State's machine is the use upon the fabric of a centrifugal force caused by rapid rotation, a process which is wholly different from the original hand process, and one which State in the experiments which he carried along in the development of his machine, first found he could utilize. Briefly stated, his machine may be thus described: He took the old core wheel of the hand process, and used impregnated strips of fabric and formed the outer or tread portion of the shoe and cemented it to the core, just as had been done in the old hand process. He continued that process just as it had been in the hand process, down to the point where he plastered or cemented the fabric on to the core down to the median line point. But here he changed to something the old hand process had never used, namely, the machine was speeded up to a point where the revolution of the wheel and flying skirt of the uncemented loose fabric stretched itself radially and formed thereby radial, diamond-shaped interstices, which contracted the normal length of the fabric.

At this point we note that State made use of a shifting platform, on which he mounted on each side of the tire spinning wheels or rolls so pressed inwardly by springs that as the rolls revolved they engaged and pushed inward and against the sides of the core the stretched flying skirts of the fabric. Thereby he then, and by the wheels, pressed and cemented the radially stretched and therefore puckerless fabric against the lessening sides of the shoe clear down to the bead edge. It will therefore be seen that the *essence of his disclosure* was the *rapid, sustained, regular revolution of his core, the use of a shifting platform on which he located his spinning*

rolls, and the constant, regular and uniform exertion of pressure upon those spinning rolls, causing them to automatically press the automatically stretched and loose fabric, or skirts, in an un wrinkled state, on the bead of the lower surface of the core.

If this statement of the process be correct, and there can be no doubt in that regard, it follows that the process is a unitary one, is a continuous one, is an interrelated one, is an undivided one, and that there is a continuity of uniform, sustained, progressive, advance from the start to the finish of this machine-made tire, which is brought about *by the rapid revolution of the core wheel acted upon by the spin of spring-controlled engaging rolls co-operating with the centrifugal force generated by the rapid motion of the core.* In other words, *united, co-operating, conjoint functioning of the core speed and spinning rolls, effected by roll springs and the shift of roll platform, all conjointly functioning to produce a unitary machine result which neither of them separately could effect.* Such being the *mechanical fact*, who shall combat the patent deduction that these elements brought together and assembled for the first time by State, *stamp the combination as an inventive combination and not as a mere mechanical aggregation of disjointed steps.*

At no single stage of this machine's processes do we find a complete, separate, finished entity. Standing alone, the tread with its circumferential diamond shaped interstices is nothing; the median or square portion with its normal square is nothing; the bead with its radial stretch and diamond pointed interstices is nothing. *It is when each co-operating element in combination with its fellows has done its individual but still co-operating work, we produce the unitary and finished product which State for the first time made by machinery and which made such a great change in the tire art. Each element acts and has to co-act with its fellows to produce the unitary result and make the unitary product which alone the machine was fashioned and devised to produce."*

The picture presented to Judge Buffington's mind was the contrast of the construction and operation of the instrumentalities employed in the execution of the ordinary hand-spinning process, on the one hand, with the construction and operation of the new combination of instrumentalities of State, on the other hand. He saw that, in the hand-spinning practice, there was a core which was rotated by hand at a low, irregular and diminishing speed, quite incompetent to stretch and efficiently throw out the skirt of the circumferentially attached fabric; while, in the State machine, there was a core, driven by power at a uniform speed sufficiently high to throw out the skirt of the fabric by centrifugal force. He saw, in the hand practice, a hand-held spinning roll which an operator was endeavoring to apply by the strength of his hand and arm to the skirt of the fabric with a necessarily variable pressure, on a line more or less radial and with an unregulated degree of advance; while in the State machine, he saw a spinning roll carried by a hinged support which, in turn, was mounted upon a carriage that worked in fixed guides that *compelled* a movement of the spinning roll in a fixed radial line, and which spinning roll was also automatically pressed to its work by a spring that exerted a pre-regulated uniform pressure upon the outflung skirt of the fabric and that was no more tired at the end of the day than it was at the beginning.

He saw that, whereas the radial advance of the spinning roll, in the hand practice, was not only in a more or less irregular path under the varying pressure of the hand and arm of the individual operator, but also at an irregular rate dependent entirely upon the skill and strength of the operator; whereas, in the State machine, he saw that the spinning roll was not only advanced in a fixed, definite path under pre-regulated pressure, but at a rate governed by an accurate screw feed

which could be regulated and controlled to a nicety. And he finally saw that, whereas, in the hand practice, due to the low speed of the core and the necessarily irregular mode of application of the spinning roll to the skirt of the fabric, the latter, if stretched at all, would be stretched so little as not to elongate the meshes of the fabric, radially, as the bead was approached; while, in the State machine, due to the high, uniform rotation of the core by power, and the consequent violent outflinging of the skirt by centrifugal force, and the application of the spinning roll to such outflung skirt, there is brought about the requisite radial stretch of the fabric and the radial elongation of the meshes thereof through the bead zone.

In other words, the learned Judge visualized, in the State machine, the combination of

- (a) a rapidly rotating core upon the periphery of which the strip of fabric was applied and circumferentially stretched and by the rotation of which the skirts of the fabric were violently thrown out by centrifugal force to render them puckerless, wrinkleless and taut;
- (b) spinning rolls for acting upon the outflung skirts of the fabric at their attached or hinged portions;
- (c) hinged supports for the spinning rolls;
- (d) power pressure means applied to the spinning roll supports for keeping the spinning rolls to their work under pre-regulated pressure;
- (e) a radially sliding carriage running on fixed guides, upon which carriage the spinning roll supports were mounted, for compelling the traverse of the spinning rolls invariably in right lines;

(f) and means (the screw feed) for positively and regularly advancing the spinning roll carriage in its fixed path of movement,

whereby the power-pressed spinning rolls were applied to the centrifugally outflung taut skirts of the fabric from the hinge portions toward the edges thereof in always advancing definite spiral lines of contact, resulting in the uniform radial stretching of the meshes of the skirts of the fabric and the close application of said skirts through the bead zone of the tire, without the puckering or wrinkling of the fabric at any point.

Defendant would have this Court believe that Judge Buffington pitched the whole novelty of State's achievement on what he conceived to be the action of centrifugal force upon the skirts of the fabric to elongate the meshes thereof radially under the high rotation of the forming core; but nothing could be further from the fact, as shown by the italicized passages of his opinion, above quoted.

It was the new combination of the high speed core with the spinning rolls mounted to travel at regulated degrees in fixed radial guides and under pre-regulated pressure that he characterizes as State's invention.

Whether the centrifugal force applied to the outflung skirts of the fabric is sufficient, in and of itself, to effect, or to initiate, the radial elongation of the meshes of the fabric through the bead zone, is quite immaterial. Judge Buffington may or may not have ascribed too much power to that force; but the outstanding *material fact* is, that he finds that it is the combination of (1) the high speed power-driven core that functions to violently fling out and outstretch by centrifugal force the skirts of the fabric so that they shall be puckerless, unwrinkled and taut, with (2) the mechanically guided, power-

pressed, mechanically advanced spinning rolls, that does effect the radial stretching of the meshes of the fabric through the bead zone of the tire. It is neither of these instrumentalities *alone*, but the *combination* of all of them that constitutes the novel, patentable entity. That the ultimate result of the action of the co-operating elements of the recited combination upon the skirts of the fabric is as stated, admits of no dispute, upon the proofs in the case (Waterman, Vol. I, p. 283, Q. 73). The share that each of the elements contributes to the result can be of no particular moment, so long as the result itself is reached by their co-operative combined action.

In view of defendant's present contentions, it is interesting to note the following admissions made on page 133 of its brief below:

"It does seem to be a fact that, if a machine generally similar to that of the patent in suit is arranged to be operated with the core having a high speed rotation in the neighborhood of that specified in the patent (207), the spinning rollers can act upon the skirts of the ouflying fabric so as to stretch them and change the recticulations of the fabric near the bead portion from a square shape to a diamond shape with the long axis radial."

Claims in Suit.

The meaning of the selected claims is clarified and qualified by the disclaimer, which will be subsequently discussed. For purposes of convenience, pertinent portions are respectively quoted in connection with the several groups of claims.

FIRST GROUP.

"4. An open tire-shoe making machine comprising the combination of a sheet-fabric supply, a power-driven ring-core, a radially moving support laterally spring-pressed toward the core, and a spinning-roll mounted on the support for passing radially along

the sides of the tire-shoe to shape the sheeted fabric on the core, substantially as described.

5. An open tire-shoe making machine comprising the combination of a sheet-fabric supply, a power-driven ring-core, a radially moving support laterally spring-pressed toward the core, and a spinning-roll mounted on the support at a receding angle to the plane of the core for passing radially along the sides of the tire-shoe to shape the sheeted fabric on the core, substantially as described.

6. An open tire-shoe making machine comprising the combination of a sheet-fabric supply, a power-driven ring-core, a radially moving support laterally spring-pressed toward the core, and a spinning-roll having a rounded disk-shaped working edge mounted on the support for passing radially along the sides of the tire-shoe to shape the sheeted fabric on the core, substantially as described.

7. An open tire-shoe making machine comprising the combination of a sheet-fabric supply, a power-driven ring-core, a radially moving support laterally spring-pressed toward the core, and a spinning-roll having a rounded disk-shaped working edge mounted on the support at a receding angle to the plane of the core for passing radially along the sides of the tire-shoe to shape the sheeted fabric on the core, substantially as described."

This first group of claims is to be construed in the light of the following language extracted from the disclaimer:

"In respect to each of claims 4, 5, 6 and 7, of said patent, I hereby disclaim any combination of the recited elements *except when* constructed and co-ordinated for shaping and applying a previously un-shaped sheet-fabric strip to that part of the recited ring-core beyond the tread portion, *and unless* the ring-core is rotatable at fast speed by the power-drive, whereby the unapplied fabric portion is thrown out from the side of the ring-core by centrifugal force, and the recited spinning-roll support

is mechanically mounted to ensure its radial movement with a gradual advance in proper relation to the fast rotating ring-core, whereby the spinning-roll, by such gradual advance over the ring-core and while pressed toward it, acts gradually upon the centrifugally thrown-out fabric to shape it to the side of the rotating ring-core while bringing it into adhesive contact therewith."

SECOND GROUP.

"12. An open tire-shoe making machine comprising the combination of a stock-roll for carrying a strip of sheet-fabric, a ring-core, a slow-speed mechanism for actuating the core when receiving fabric from the stock-roll, a radially moving spinning-roll for passing radially over the side of the tire-shoe to shape the fabric on the core, fast-speed mechanism for actuating the ring-core during the operation of the spinning-roll, and speed-changing mechanism, substantially as described.

13. An open tire-shoe making machine comprising the combination of a stock-roll for carrying a strip of sheet-fabric, a ring-core, a slow-speed mechanism for actuating the core when receiving fabric from the stock-roll, a radially moving support laterally power-pressed against the ring-core, a spinning-roll mounted on the support at a receding angle to the ring-core to pass over the side of the tire-shoe to shape the fabric on the core, a fast-speed mechanism for actuating the ring-core during the operation of the spinning-roll, and speed-changing mechanism, substantially as described."

This second group of claims is to be construed in the light of the following language extracted from the disclaimer:

"In respect to each of claims 12 and 13 of said patent, I hereby disclaim any combination of the recited elements *except for* the combined operations of first stretching the middle or tread portion of a previously unshaped fabric strip onto the recited

ring-core and thereafter shaping and applying to the ring-core the fabric beyond the tread portion, *and unless* the recited elements are so constructed and co-ordinated that before the change from slow speed to fast speed the fabric strip as drawn from the recited stock-roll onto the ring-core is stretched circumferentially under uniform tension while applying it to the tread portion, and, after the change to fast speed, the unapplied fabric beyond the tread portion is thrown out from the side of the ring-core by the consequent centrifugal force, while the recited spinning-roll, in its radial movement, acts gradually upon the centrifugally thrown-out fabric, to shape it to the side of the rotating ring-core beyond the tread portion while bringing it into adhesive contact therewith."

THIRD GROUP.

"22. An open tire-shoe making machine comprising the combination of a sheet-fabric supply, a power-driven ring-core, a radially moving support laterally power-pressed toward the core, and a spinning-roll mounted on the support for passing radially along the sides of the tire-shoe to shape the sheeted fabric on the core, substantially as described.

23. An open tire-shoe making machine comprising the combination of a sheet-fabric supply, a power-driven ring-core, a radially moving support laterally power-pressed toward the core, and a spinning-roll mounted on the support at a receding angle to the plane of the core for passing radially along the sides of the tire-shoe to shape the sheeted fabric on the core, substantially as described.

24. An open tire-shoe making machine comprising the combination of a sheet-fabric supply, a power-driven ring-core, a radially moving support laterally power-pressed toward the core, and a spinning-roll having a rounded, disk-shaped working edge mounted on the support for passing radially along the sides of the tire-shoe to shape the sheeted fabric on the core, substantially as described.

25. An open tire-shoe making machine comprising the combination of a sheet-fabric supply, a power-driven ring-core, a radially moving support laterally power-pressed toward the core, and a spinning-roll having a rounded, disk-shaped working edge mounted on the support at a receding angle to the plane of the core for passing radially along the sides of the tire-shoe to shape the sheeted fabric on the core, substantially as described.

26. An open tire-shoe making machine comprising the combination of a sheet-fabric supply, a power-driven ring-core for drawing the sheet-fabric from the source of supply in a flat condition, a radially sliding support, and a laterally yielding spinning-roll on the support for passing radially along the sides of the ring-core to curve and shape the sheeted fabric thereon, substantially as described."

This group of claims is to be construed in the light of the following language extracted from the disclaimer:

"In respect to each of claims 22, 23, 24, 25 and 26, of said patent, I hereby disclaim any combination of the recited elements *except when* constructed and co-ordinated for shaping and applying a previously unshaped sheet-fabric strip to that part of the recited ring-core beyond the tread portion, *and unless* the power-drive for the ring-core functions by a sufficiently high speed of rotation and consequent centrifugal force to throw the unapplied fabric portion out from the side of the ring-core, while the recited spinning-roll, in its radial movement and while pressed toward the ring-core, functions by a gradual action upon such centrifugally thrown-out fabric to shape it to the side of the rotating ring-core while bringing it into adhesive contact therewith."

Defendant's Expert Criticisms.

Defendant's expert has elaborated various fantastic theories in connection with the State disclosure. In most instances their absurdity is patent, and they come to an

untimely and tragic end, which is the fate of theory when it encounters destructive fact.

For the most part he bases his arguments on trivial draftsmen's errors, notably in Figs. 12 to 12c. It is thoroughly established law that patent drawings are not working drawings and are not made to scale. These selected figures are merely rough diagrammatic sketches intended to illustrate to the eye certain special features. To base a theory on such purely conventional illustration is totally improper, and particularly when the alleged mode of action is directly contradicted by clear description in the specification.

Initial Circumferential Stretching. For instance, he says in effect that Fig. 12 does not properly illustrate a circumferential stretching operation, and that the tension employed is not sufficient to shape the fabric over the tread portion. This is without foundation as the specification does not say that Fig. 12 shows any such thing. Plaintiff's expert points out (Vol. I, p. 442, Q. 12) that this figure indicates "the condition when the workman first brings the leading edge of the fabric into contact with the periphery of the core". If defendant's expert had really sought information on the stretching operation, he would have turned to Fig. 2, the only figure in the case which shows it, and wherein the ply is shown as attached to the core and being stretched over the tread portion by the tension devices. In addition, this allegation by defendant's expert of little or no initial stretch is largely contradicted by his own previous and apparently forgotten statement in discussing the State patent (Vol. I, Q. 5, p. 213) :

"In the condition shown in Fig. 2, the workmen would engage the low speed drive to revolve the core 115 slowly, thereby drawing the fabric from the supply and stretching it at the same time. A tension mechanism is provided for the tension roll 36, which

is seen at the left of Fig. 2 at 42, 43 and more in detail in Fig. 7 on the same sheet. The purpose of revolving the core by power is to *relieve the workmen of the physical strain of stretching the fabric, thereby getting a more uniform stretch.*"

Moreover, the State patent fully describes a tension mechanism to resist the rotation of the fabric-supply rolls. It is illustrated in Fig. 7 and tension is repeatedly referred to in the specification,—at page 1, lines 97 to 102; page 2, beginning at line 101 and extending through to line 33 of page 3; at page 3, lines 69 to 72; and at page 6, lines 106 to 114. For instance:

"The tension-roll constitutes a highly important element since it secures the application of the several layers of fabric to the ring-core with a uniform degree of tension" (p. 2, line 107).

And again:

"If increased tension is desired on the tension-roller 36, the turn buckle 47 is manipulated so as to cause a contraction of the friction band 43 on the disk 42 to a determined degree, indicated by the gage 46 so that a predetermined amount of resistance will be offered to the turning or movement of the tension-roller 36."

Undoubtedly all this contemplates tension mechanism adequate to stretch the fabric to any desired extent as it is drawn on to the slowly rotating core. In addition, several witnesses testify that the stretch employed in the commercial State machines, including Plaintiff's Exhibit No. 2, is twelve per cent. See for instance State's answer to Q. 197, p. 328, Vol. I.

Tread Roll. With regard to Fig. 12^a, defendant's expert in effect alleges that after the fabric is thus lightly applied to the core, the tread roller 141 is relied on to

shape it to the tread zone. As already pointed out, the fabric is stretched circumferentially on the core, and the stated purpose of the tread roll is to smooth the "tread" and free it from air bubbles or wrinkles, if such be present. In other words, it is merely a precautionary device, and is in no way involved in the present litigation. These functions of the tread roll are fully described in the State specification, as at page 5, lines 54 to 60, and lines 83 to 89.

Spinning-roll action. These expert assumptions of mode of operation become more grotesque as they proceed. Referring next to Figs. 12b and 12c, and because in this diagrammatic illustration the rolls are not shown as actually pressing the fabric against the core, defendant's expert theorizes that this never happens and that the rolls lie and act in the loops of the skirts "instead of pressing the fabric strongly against the core". This amazing phenomenon he attributes to the high speed stated in the specification as "*say* at two hundred seven turns a minute", given by way of example. As before pointed out, this speed of 207 R. P. M. is ten per cent. less than that of the first commercial machine.

Just how State's rolls could operate in the loops of the fabric and without pressing it against the core is not explained by defendant's expert, nor is it capable of explanation. Defendant would have the Court believe that for some occult reason, like the suspension of Mahomet's coffin, the rolls would not press against the core notwithstanding the "strong springs" provided for that purpose. Such an effect would involve an operation of mechanical forces totally unknown to man. It is based entirely on the diagrammatic illustration, the purely conventional nature of which is further indicated by the fact that in Fig. 12c the rolls are carelessly shown as *not even in contact with the fabric*. This space is more

apparent in the lighter prints; in the blacker prints, like that in the record, the thicker lines merge and tend to obscure it.

State says (Vol. I, p. 328, Qs. 202, 203) that in his machine the rolls always press the fabric against the sides of the core; and that he never knew or heard of a mode of operation wherein the rolls were held outwardly away from the core by reason of the centrifugal effect of the outflung skirts. In the commercial machine, the fabric is always pressed against the core. This is so also in Plaintiff's Exhibit No. 2 (Vol. I, p. 447, Q. 18) wherein the speed is higher than that suggested in the patent.

Moreover, this theory that the rolls do not press the fabric against the core is killed by the very precise description in State's specification to the contrary effect. Note the language of the sentence on page 1, lines 57 to 61, which says that the rolls "gradually *press* the canvas *in contact* with the sides of the ring-core". Again, at page 5, lines 93 to 97, the rolls are said to "exert considerable *pressure on the fabric*". At page 5, lines 108 to 117, it is in part stated that "*strong* spiral springs will be used. These springs exert *pressure against* the fabric for forming it *against* the sides of the core." Again, page 5, lines 129 *et seq.*, State says that the rolls may be "either spring or weight *pressed laterally against* the ring-core". In the passage on page 6, lines 2 to 17, weights, springs or other power are described three times as "*pressing* the spinning-rolls" "*against* the ring-core". In the claims in suit the roll is described as pressed toward or against the core, for instance in claim 13, it is said to be "*power-pressed against* the ring-core".

Moreover, in stating this theory, defendant's expert relies entirely on the two or three diagrammatic views, and utterly ignores the mechanical view of Fig. 9, wherein the rolls are clearly shown as pressing the fabric against the core. He *does* refer to the roll 147 "shown

in Fig. 9" at an earlier point when he is outlining the disclosure of the patent (Vol. I, p. 214), and as in a previous instance, his testimony then directly contradicts his later theory. He said,

"Thus by simultaneously operating the hand wheel 124 and the handle 142, the operator performs the smoothing down of the fabric *against the core, just as was usual in the hand building of tires.*"

This amusing inconsistency occurs, because in the quoted language he was endeavoring to emphasize anticipation by hand spinning. He forgot this position when later on he began to develop the theory that the rolls did not press the fabric against the core at all.

Even though an undue amount of space may have been allotted to these expert theories, it seemed advisable, not alone for the purpose of exploding them, but chiefly to indicate the strained and untenable character of the defenses.

Drawings generally. These expert criticisms and theories have been based largely on rough and diagrammatic illustration, which is perfectly permissible in patent drawings. And even assuming that the errors were more important ones, they are of no consequence if the description be clear. The authorities are numerous and as they are to the same effect, only a limited number need be referred to:

Western Co. v. American Co., 131 Fed. 75:

"The drawings are not required to be working plans. They must be read in connection with the description and claims and any inferences arising from omissions or inconsistencies in the drawings must yield to a legally sufficient specification."

Cutler-Hammer Mfg. Co. vs. Union Electric Mfg. Co.,
147 Fed. 266 (269):

"To dispose of these two objections we must remember that the drawings of a patent are addressed to those who are skilled in the art. Furthermore, drawings must be considered in connection with the claims and specification, and each figure must be construed in the light of the other drawings."

Manhattan Co. v. Fuller Co., 204 Fed. 287:

"Undoubtedly a patented device is not to be held inoperable because slavish adherence to the drawings develops obstacles. Such drawings are often diagrammatic, and rarely, we fancy, drawn to a scale."

American Valve Co. v. Fairbanks, 249 Fed. 234:

"It is also claimed that the patent drawings, if scaled, do not exactly accord with the written description and the claims. But drawings are to be taken as illustrative⁸ of the idea of the patent, not as working plans."

Plaintiff's expert (Vol. I, p. 448, Qs. 23 to 25) speaks from his own long experience to the same effect, and says that diagrammatic illustration, such as Figs. 12 to 12c, is usual in patent drawings. As an instance of similar lack of exactness, he points out (Vol. I, p. 448, Qs. 26 to 28) *one in defendant's patent* in evidence, wherein two sets of figures are totally irreconcilable as to the position of the shaft 115, and says that notwithstanding the more serious nature of the error, it was simply a draftsman's mistake, and not an irremediable one.

Spiral Gearing.

Defendant in the Court of Appeals below advanced still another alleged deficiency in the State disclosure, in respect to the gearing shown to rotate the core. It is also in large measure based upon the purely conventional

illustration and description, such as are ordinarily employed in connection with minor matters like gearing, the precise form of which is unessential because of the multitude of arrangements capable of producing a specified result. This was obviously the view of defendant in the *Firestone* litigation, wherein the subject was not even mentioned. The defense was so thoroughly demolished by plaintiff in rebuttal, that it is no longer relied upon, and hence will not be discussed.

**Statement of Complete Mode of Action
Unnecessary.**

It is no argument against the merit of State's invention or the validity of his patent that the specification does not set forth in full every stage and every result of his procedure. For instance, the patent does not refer to the changes in the reticulations of the fabric, involving the formation of circumferential diamonds at the tread and radial diamonds at the bead. These were inherent in the type of carcass he was seeking to produce. But it does describe the mechanism for securing the two kinds of stretch, namely, the tension devices which retard the fabric with reference to the slow rotating core so as to stretch the tread zone circumferentially, and the advancing spinning rolls which are power-pressed against the fast rotating core so as to stretch the skirts radially. If the mechanism be thus recited, it is not necessary to enumerate its specific results.

So far as the general purposes are concerned, the specification is clear. For instance (p. 1, lines 57 to 61):

" * * * Thereupon a pair of spinning-rolls by radial motion with respect to the ring-core gradually press the canvas in contact with the sides of the ring-core toward its internal periphery to shape the sides of the tire."

The effect of this pressing and shaping operation is to stretch the fabric radially and to produce the radial diamonds. Again it refers to the rolls in the following language (lines 65 to 70) :

“* * * The spinning-rolls are also radially movable with reference to the ring-core. They have been found peculiarly efficient in shaping the sides of the tire-shoe and form an important feature of my invention.”

And then it proceeds to say that the rolls “are sharply differentiated from the hammers or sliding finger devices heretofore proposed for the purpose”. This distinguishes State from Vincent who used the “hammers”, and from Seiberling & Stevens who had the “sliding finger devices”.

The specification details at great length the arrangement of the rolls in the matter beginning at line 93 of page 5 and ending at line 45 of page 6. This passage starts with the statement that “they revolve at high speed and exert considerable pressure on the fabric”. It then enumerates various specific features, such as the provision of the handles on the arms; the springs, weights, or other devices for pressing the rolls against the core; the formation of the rolls with rounded edges so as not to cut the fabric and to secure effectual contact with it along the sides of the ring-core; the location of the rolls at a receding angle so as to obtain “a better forming action on the fabric”; etc., etc.

The core is described as rotated “say at two hundred seven turns a minute”, a speed sufficient to produce the centrifugal effect, with the further statement that by this means “the machine not only does more work in a given time but *it does better work*”. The description says (p. 6, lines 38 to 40) that “the centrifugal force tends to throw the fabric out at a right angle from the core-plane”, and proceeds to explain that the receding

angle of the rolls prevents their entanglement with the fabric.

Other similar passages could be quoted, but without further elaboration there is unquestionably ample description to cover the devices which effect the ultimate result, namely, a rapidly rotating core upon the periphery of which the strip of fabric is applied and circumferentially stretched and by the rotation of which the skirts of the fabric are violently thrown out by centrifugal force to render them puckerless, wrinkleless and taut; spinning rolls for acting upon the outflung skirts of the fabric at their attached or hinged portions; hinged supports for the spinning rolls; power pressure means applied to the spinning roll supports for keeping the spinning rolls to their work under pre-regulated pressure; a radially sliding carriage running on fixed guides, upon which carriage the spinning roll supports are mounted, for compelling the traverse of the spinning rolls invariably in right lines; and means (the screw feed) for positively and regularly advancing the spinning roll carriage in its fixed path of movement, whereby the power-pressed spinning rolls are applied to the centrifugally outflung taut skirts of the fabric from the hinge portions toward the edges thereof in always advancing definite spiral lines of contact. When such is the case, a complete statement of the several steps and their resulting effects on the fabric may be omitted. The authorities are numerous.

A leading case is *Eames vs. Andrews*, 122 U. S. 40 (55) :

"It is to be observed that the scientific theory and principle, the application of which is supposed to constitute the invention of Colonel Green, are not set forth either in the original or reissued patents. This feature was commented upon by Mr. Justice Blatchford in *Andrews v. Cross*, 19 Blatchford, 294, 305, as follows: 'It may be that the inventor did not know what the scientific principle was, or that, knowing it, he omitted, from accident

or design, to set it forth. That does not vitiate the patent. He sets forth the process or mode of operation which ends in the result, and the means for working out the process or mode of operation. The principle referred to is only the why and the wherefore. That is not required to be set forth. Under § 26 of the act of July 8, 1870, 16 Stat. 201, under which this reissue was granted, the specification contains a description of the invention and of 'the manner and process of making, constructing, compounding, and using it', in such terms as to enable any person skilled in the art to which it appertains to make, construct, compound, and use it; and even regarding the case as one of a machine, the specification explains the principle of the machine, within the meaning of that section, although the scientific or physical principle on which the process acts when the pump is used with the air-tight tube, is not explained. *An inventor may be ignorant of the scientific principle, or he may think he knows it and yet be uncertain, or he may be confident as to what it is, and others may think differently. All this is immaterial, if by the specification the thing to be done is so set forth that it can be reproduced.*"

Diamond Rubber Co. vs. Consol. Rubber Co., 220 U. S. 428 (435) :

"* * * A patentee may be baldly empirical, seeing nothing beyond his experiments and the result; yet if he has added a new and valuable article to the world's utilities he is entitled to the rank and protection of an inventor. *And how can it take from his merit that he may not know all of the forces which he has brought into operation? It is certainly not necessary that he understand or be able to state the scientific principles underlying his invention, and it is immaterial whether he can stand a successful examination as to the speculative ideas involved.* *Andrew v. Cross*, 8 Fed. Rep. 269; *Eames v. Andrews*, 122 U. S. 40, 55; *St. Louis Stamping Co. v. Quinby*, 16 Off. Gaz. 135; *Dixon Wood Co. v. Pfeifer*, 55 Fed. Rep. 390; *Cleveland Foundry Co. v.*

Detroit Vapor Store Co. (C. C. A., Sixth Circuit), 131 Fed. Rep. 853; *Vann Epps v. United Box Co.* (C. C. A., Second Circuit), 143 Fed. Rep. 869; *Westmoreland Specialty Co. v. Hogan* (C. C. A., Third Circuit), 167 Fed. Rep. 327. He must, indeed, make such disclosure and description of his invention that it may be put into practice. In this he must be clear. He must not put forth a puzzle for invention or experiment to solve but the description is sufficient if those skilled in the art can understand it. This satisfies the law, which only requires as a condition of its protection that the world be given something new and that the world be taught how to use it. It is no concern of the world whether the principle upon which the new construction acts be obvious or obscure, so that it inheres in the new construction."

The Grant Patent Litigation.

One of the authorities just cited, *Diamond Rubber Co. v. Consolidated Rubber Co.*, 220 U. S. 428, seems to merit individual discussion because of its close parallelism in many respects to the present circumstances. It is a leading case on the point that the correct principle and mode of action of a patented mechanism need not be set forth in the specification. It holds that "the law has other tests of the invention than subtle conjectures of what might have been seen and yet was not." Again, it says, "Nor does it detract from its merit that it is the result of experiment and not the instant and perfect product of inventive power." The reading of the opinion will develop numerous points of doctrine that confirm plaintiff's contentions.

This case was the climax of protracted litigation and finally came before this Court by *certiorari*, because of diversity of holdings in different circuits. The Grant patent was for a tire of solid rubber provided with retaining wires, in combination with a vehicle wheel, the tire and wheel being formed in certain specified ways so

as to co-act with each other. Without detailing the long list of cases in which it was involved, and which are stated at the outset of the opinion, it may be noted generally that the patent was invalidated by the Court of Appeals in the Sixth Circuit, and by one or more courts in other circuits following its opinion. It was then sustained by other courts, notably by the Court of Appeals in the Second Circuit, and ultimately came up to this Court. Briefly stated, the Courts in the second circuit held the patent valid, because the tire possessed a certain *tipping* capacity. This Court said:

"This tipping capacity is made the pivot of the controversy. It was as to that that the courts of appeals of the sixth and second circuits disagreed either upon the difference of the testimony in the cases, or more deeply, on principle. The controversy and Grant's alleged ignorance of the tipping characteristic of the tire really present some anomaly. The tire has utility, a utility that has secured an almost universal acceptance and employment of it, as will subsequently appear. It was certainly not an exact repetition of the prior art. It attained an end not attained by anything in the prior art, and has been accepted as the termination of the struggle for a completely successful tire."

And the opinion proceeds to detail other points which closely resemble those at bar, including the requisites of invention, commercial success, infringement, and failure to anticipate by prior tires which seemed close from a superficial standpoint. If another point should be emphasized, it is that this tipping capability, on which the patent was sustained, was nowhere mentioned in the specification, and was first discovered in the commercial employment of the tire. If still another specific feature is to be made prominent, it is that this Court upheld the several courts of the second circuit in their refusal to be bound by the finding of the Court of Appeals in the Sixth Circuit.

Goodyear Machines.

Like the machines furnished to the licensees, those in the Goodyear plant correspond to the showing in the patent in suit, and the same is true as to Plaintiff's Exhibit No. 2, as testified to by plaintiff's expert (Vol. I, p. 40). The statement is made in connection with the theory of defendant's expert that in the patent the rolls do not press the fabric against the core. As already shown, the specification itself negatives any such theory, and State has testified that he never heard or knew of any such mode of operation (Vol. I, p. 328, Qs. 202, 203).

There are of course some differences in the details in these commercial machines, but none of them affect the subject matter at bar (Vol. I, p. 80, x-Q. 164). Defendant's expert discusses them, and admits (Vol. I, p. 232) that the spinning-rolls do not rest in bights or loops of the unapplied fabric but pinch or compress it against the core. The principal distinction he dwells on is that the roll 36 is slightly barrel-shaped rather than cylindrical and thus tends to shape or preform the fabric; but as to this plaintiff's expert testifies (Vol. I, p. 458, Q. 42) that this is the case only in a minority of the machines he inspected, and that even then the departure from cylindrical form is so slight as to require critical attention to observe it, and is intended merely "to keep the fabric running straight", and that there is no shaping of the fabric thereby.

With regard to the quality of work, both Browne and Ray testify that it is of high grade. In view of the fact that sixty millions of tires have been made on these machines, they seem good enough to meet the requirements of the trade.

Defendant, in its brief (p. 110), refers to the photographs of the Goodyear machine (Vol. II, p. 191) as showing the presence of puckers in the skirts of the fabric.

Defendant does not state, however, as it is so careful to do in connection with the photographs of the Belgian Model, that these photographs were taken while the machine was still. Nor does defendant mention the fact that the fabric plies have not as yet been wrapped around the beads in the finishing operation. *It is interesting to note that the photographs do not show pockers or wrinkles in any part of the fabric upon which the spinning rolls have acted.*

Alleged Aggregation.*

As already discussed, the claims in suit (except 12 and 13) are confined to the combination of the high speed power-driven core that functions to violently fling out and outstretch by centrifugal force the skirts of the fabric so that they shall be puckerless, unwrinkled and taut, with mechanically guided, power-pressed, mechanically advanced spinning rolls, that effects the radial stretching of the meshes of the fabric through the bead zone of the tire. There is a reference to "a sheet-fabric supply", but no mechanism for supplying the fabric is included. As the purpose of the forming-rolls is to act on the sheet fabric after it has been preliminarily placed on the core, it is eminently proper that the fact be referred to, and the quoted expression does no more than this. It may also be noted that this particular language was introduced by amendment into the claims for the purpose already mentioned, viz., to indicate that the spinning-rolls were designed to operate on sheet fabric.

Claims 12 and 13 are in a somewhat different category, in that in addition to the final operation by the forming-rolls of shaping down the fabric on the side of the core when it is rotated by the fast-speed mechanism, they also include the initial step of stretching the sheet-fabric from the stock-roll on the core when actuated by

* Defendant is apparently no longer relying upon this defense.

the slow-speed mechanism. In other words, these two claims set forth the complete machine construction, including the stock-roll, both the high-speed mechanism and the low-speed mechanism, and speed-changing mechanism, so that either speed may be availed of.

The Court of Appeals for the Sixth Circuit held in effect that claims of this description, involving sequential operations, were aggregation and not combination. In support of this position it cited *Gas Co. v. United Co.*, 228 Fed. 684, one of its own opinions. The subject matter there was apparatus for making water-gas, which was provided with a gauge, and certain valves to be manually operated. When the gauge indicated a certain condition, the attendant would operate one or other of the valves. As the opinion states:

“* * * The gauge gave notice to the operator that he should do something, and then its function was finished until it again gave him similar notice.”

Of course, there was no combination in this. But the facts here are totally differentiated. The State construction embodies an organized machine, with two speed mechanisms, one to effect the original or circumferential stretching, and the other the second or radial stretching, and is further provided with a speed-changing mechanism whereby either speed may be called into action at will.

A much more pertinent Sixth Circuit case might have been selected by the Court of Appeals, namely, *National Tube Company vs. Aiken*, 163 Fed. 254, involving patent 450,360 for Mechanism for Conveying and Cooling Metal Plates. A typical claim of the patent involved reads as follows (55 O. G. 213) :

“As a means for conveying and cooling metal plates, the combination, with rolls adapted to roll metal plates, and the rolling mill feed table, of conveying tables, one of which is situate adjacently to and is independent of the feed table and is adapted

to receive the metal plates therefrom, and transfer mechanism adapted to transfer the plate from the first table to the next, substantially as and for the purpose described."

It was objected that this and other claims of the patent were for mere aggregations. This contention was overruled. Judge Lurton, who wrote the opinion, observed (p. 262) :

"The argument that the straightening press does not act simultaneously with the other devices included in the combination, if true, is not enough to defeat the patent. If that device is so arranged with the other devices made elements in the combination as that each part co-operates to produce a single practical and beneficial result, it is not important that that final result shall have been produced by a simultaneous or successive action of the combined elements."

The Court of Appeals for the Third Circuit, in this case, considered the defense of aggregation and disposed of it favorably to the plaintiff, citing authorities, which it is not necessary for us to here repeat.

Some of the pertinent decisions of this Court will be found on page 171 of the brief.

Emphasis is laid on the fact that even were defendant's contentions and objections as to the other claims well founded, and no such admission is made or contemplated, they would not apply to claims 12 and 13, which set forth the entire machine construction in the manner approved by the Courts. Defendant has largely based its case on the theory that State's claims now are in effect for a method which is anticipated by hand spinning. Obviously this theory falls to the ground in connection with claims 12 and 13, which present the entire coordinated mechanism whereby both the original circumferential stretching and the subsequent side-forming

action are secured. In hand spinning there was no mechanism for rotating the core at slow speed to produce circumferential stretch; there was no mechanism for rotating the core at high speed to obtain the centrifugal effect; there was no core-rotating mechanism of any description; there was no speed-changing mechanism; there was no radially moving support laterally pressed against the core; there was no mechanical means for forming the skirts of the fabric to the sides of the core; and there was even no stock-roll from which the supply could be drawn. All of these parts are covered in claims 12 and 13 and meet the test laid down by the Courts, i. e., they effect "a new unitary result, to the production of which the different elements co-act".

The Infringement.

Defendant's machine is disclosed in U. S. Letters Patent No. 1,119,326 of Thropp *et al.* This is agreed on by the respective experts. Each uses the drawings of the patent in describing the construction of the Thropp machine. The particular form complained of is that disclosed in Figs. 14 and 15 of the drawings. In the remainder of the illustration, the forming-rolls are shown as driven by electric motors, this being the only essential difference. In defendant's machine, and as illustrated in Figs. 14 and 15, the rolls are driven by contact with the fabric on the side of the core, exactly as in the State patent.

One of these machines has been introduced in evidence, as Defendant's Exhibit T, and was exhibited to plaintiff's counsel and expert prior to the beginning of testimony. This exhibition sufficed for plaintiff's *prima facie* case, although the machine was operated in a carefully selected manner so as to differentiate it from State as far as possible. Even then it clearly infringed. It will be later shown that the *actual* mode of operation, the

one followed in *commercial* practice, is quite different from that arranged for the purposes of the exhibition, and closely parallels that of the State machine.

Plaintiff's expert describes defendant's machine at length at Q. 9, Vol. I, pages 41 to 46, for convenience largely referring to the Thropp patent. In the machine itself, the high speed was 125 R. P. M. and the low speed one-tenth of that. At the low speed the flat fabric passes from the supply roll about suitable tension and guiding devices and is stretched circumferentially on the core at the tread zone. This is the first step of the double stretch system. The core is then rotated at high speed and the outflying skirts are acted upon by the forming-rolls, which are mounted on pivoted levers, the levers in turn being carried by a suitably guided carriage. The carriage is fed inwardly by a screw, and this screw may be operated manually by a hand wheel or mechanically by power. In the exhibition of the machine the screw was turned mechanically. *In commercial use the screw is turned manually, as in the State machine.* The forming-rolls are pressed inwardly by weights instead of by springs. It will be remembered that State specifies the alternative use of weights and says that he includes both weights and springs in his claims. As the core rotates rapidly, and the carriage is advanced, the rolls are pressed upon the skirts of the fabric at the hinge line, exactly as in State and with the same result, namely, the skirts being thrown outwardly by centrifugal force, and the rolls being fed gradually inward, each traces a spiral path upon the fabric and acts upon small areas thereof to fold them down at the hinge line and cause them to adhere to the core. Each forming-roll has a rounded working edge, and each is set at a receding angle to the plane of the core. The result of this is to stretch the fabric and to elongate its reticulations radially. This constitutes the second step of the double stretch sys-

tem. A comparative sketch of the two machines is here provided.

Mechanically considered (Vol. I, p. 44), in each machine there is a core, a low-speed mechanism, a high-speed mechanism, and speed-changing mechanism. There is a stock-roll for the flat fabric and tension mechanism between the stock-roll and the core. There are two forming-rolls which simultaneously act upon the opposite sides of the core and against the hinges of the skirts. Each forming-roll is carried by a swinging arm and is forcibly pressed against the fabric, by a spring in one case, and by a weight in the other. The sliding carriage which carries the rolls is mechanically mounted and accurately guided, and is fed by a screw so that it may be gradually advanced. Each roll has a rounded working edge and each is set at a receding angle with respect to the core plane. In each machine the fabric skirts are held stiffly and smoothly and without wrinkles away from the core by centrifugal force and under sufficient tension to produce radial stretch when acted upon by the rolls.

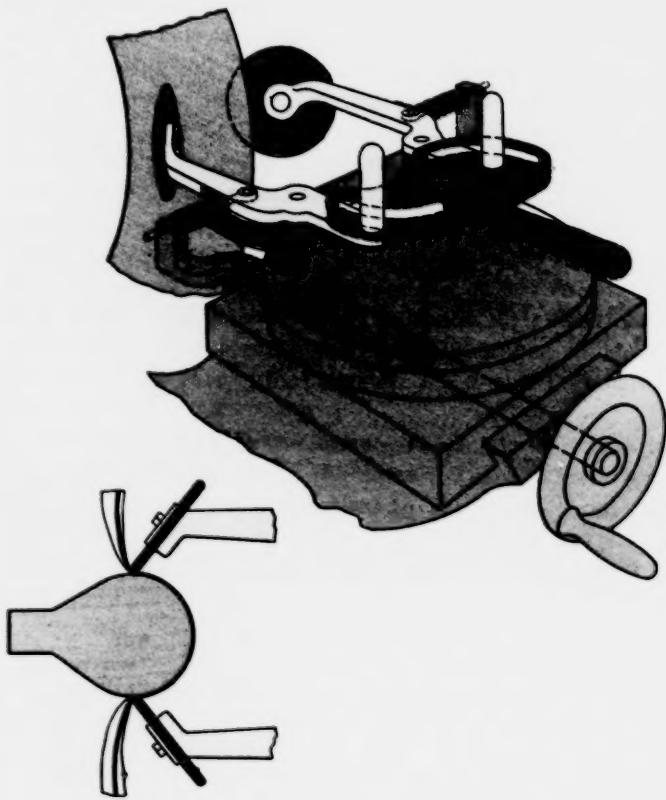
The mechanism is the same. The mode of action is the same. The result is the same. The elements present are exactly those specified in the State claims in suit.

The Court of Appeals below disposed of the matter as follows:

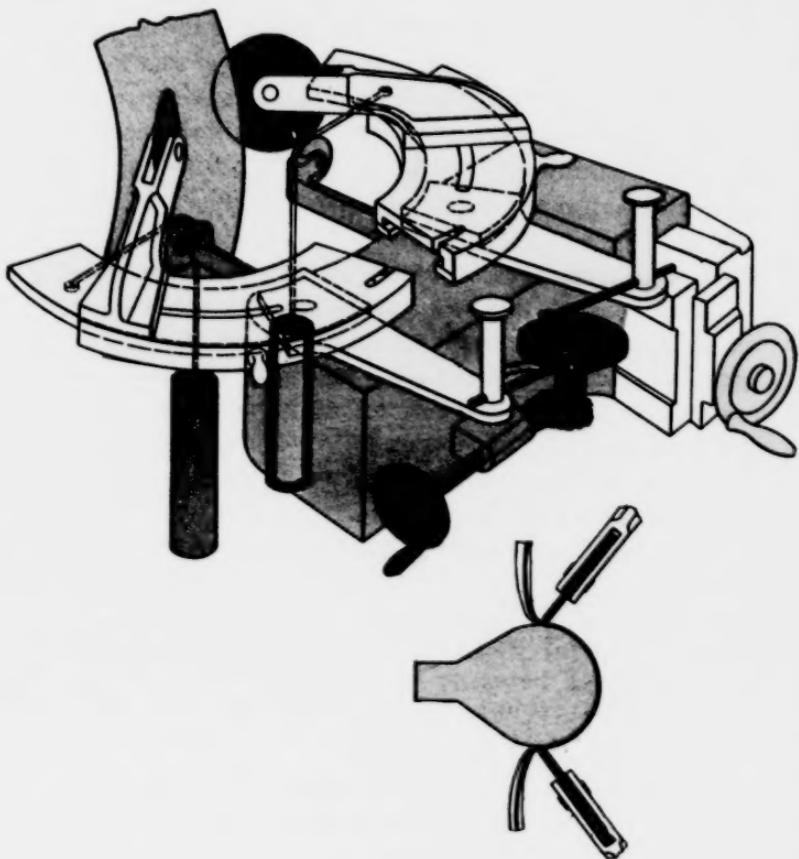
"The question of infringement is confined to a narrow limit. The essential elements of State's machine are found in the defendant's machine. We have the rapid rotation of the core. We have the loose edges, stretched by the centrifugal force induced by rapid core rotation. We have a radially moving tool support, and those tools laterally power-pressed not by the spring of State's machine, but by a weight which functions in the same way to bring the spinning rolls into one continuous shifting play, and the whole machine devised to adapt and combine



State's Machine



Defendant's Machine





in the same mechanical way State disclosed, the use of spinning rolls, co-operating with centrifugal radial stretch of the fabric to produce the unitary machine-made product, which State first made possible in the art."

Among the immaterial differences noted by plaintiff's expert (Vol. I, p. 46, Q. 10) are the following: The stock-roll is mounted above the core and is vertically adjustable. There is no tread roll. There is an automatic feed for the carriage in addition to a hand feed. There is an automatic stop motion for the carriage advance. There is an adjustable pointed gauge. The forming-rolls are mounted on supporting plates which are adjustable with reference to the supporting arms. The arms are provided with means to which they may be connected at will so that the rolls may be swung away from the core and whereby also the workman may press them against the core. There are no bead forming-rolls. The trimming cutters are mounted on an independent frame. There are special detachable bead rings. The forming-rolls are greater in diameter than those shown in the State patent, etc., etc. It will be readily seen that none of these changes is material, although defendant alleges them to be improvements.

"But advance beyond, or even improvement upon, a patented device does not cease to infringe, so long as the combination of the patented device is itself utilized in the advance." *Hess-Bright v. Fichtel*, 219 Fed. 723."

Defendant's position. There is no substantial denial of plaintiff's statements as to the construction and mode of operation of defendant's machine, as above stated. In addition, there is the admission by defendant's expert that it comprises mechanism for performing the double stretch method (Vol. I, p. 271, Q. 62):

"* * * It has means for exerting a regulated tension on the fabric to stretch it to shape. It has

spinning-rolls mounted to move radially and to be fed automatically, to spin the fabric against the core."

He endeavors, however, to differentiate along the lines of the exploded theories already discussed, and first he alleges that there is in the Thropp machine mechanism for obtaining a considerable circumferential stretch, and to this end he quotes from the Thropp patent (p. 5, line 30) :

"As the shaft 8 is rotated, it will, in turn, rotate the core 104 drawing the friction fabric off of the stock roll 66, and stretching the latter tightly about the periphery of the core 104. It will be seen that in preparing for this operation, the resistance on the roll 68 may be varied so as to get exactly the desired amount of stretching in the friction fabric on the periphery of the core; and that this stretch or tension will be exactly uniform throughout the circumference of the core, and may be much greater than that possibly attained by the strongest operative."

But this quotation from the Thropp patent is of small import since it affirms nothing more than is stated in the patent in suit. For instance State says (p. 2, line 121) :

" * * If increased tension is desired on the tension-roller 36 the turnbuckle 47 is manipulated so as to cause a contraction of the friction band 43 on the disk 42 to a determined degree, indicated by the gage 46 so that a predetermined amount of resistance will be offered to the turning or movement of the tension roller 36."*

Also (line 107) :

" * * The tension-roll constitutes a highly important element since it secures the application of the several layers of fabric to the ring-core with a uniform degree of tension."*

By comparing these two sets of quotations from the Thropp and State patents respectively, it is difficult to see that any different mode of operation or result is contemplated.

Defendant's expert then proceeds to discuss the adjustable mounting of Thropp's forming-rolls so that they may be shifted with respect to the supporting arms to vary their angle with respect to the core. This difference is immaterial as to most of the claims in suit, but will be discussed again in reference to the term "receding angle" employed in several of them.

He next refers to the fact that weights instead of springs are used to force the rolls against the core. Even if this arrangement be an improvement, it is immaterial, and particularly when it is remembered that the State specification refers to the use of weights as equivalent to springs.

He mentions the mechanical means actuating the screw to advance the rolls radially. This is also an immaterial improvement, and it is again noted that in the commercial use of defendant's machines the screw is turned manually, just as in the State machine.

He also refers to other differences already pointed out by plaintiff's expert, which need not be discussed again.

Briefly summarized, the contentions of defendant's expert, in his endeavor to deny infringement, are as follows: (1) that defendant's machine is more automatic than that of State; (2) that defendant's rolls press the fabrie against the core and that this is not the case in the State machine; (3) that defendant's carriage is advanced mechanically and not manually; (4) that defendant's rolls are not set at a receding angle; (5) that defendant's means for pressing the rolls against the core are different; and (6) that defendant's machine embodies the single stretch instead of the double stretch system. These several points will be treated separately.

Automaticity. The claim that the Thropp machine is automatic as compared with the State machine, is wholly without merit and is fully discussed by plaintiff's expert beginning with Q. 9, Vol. I, p. 437, to which reference may be had if required. In Q. 11 he compares in detail the sequence and number of manual operations necessary in the two machines and points out that there are actually more hand manipulations in defendant's machine than in that of State. The principal feature involved in this alleged automaticity is the mechanical actuation of the feed screw, which will be discussed under a separate heading.

The Courts have sustained many patents on devices involving hand control and manipulations. A leading case is *Bates v. Coe*, 98 U. S. 31, in which the mechanism in suit involved a number of hand operations. For instance, there was

"Bevel gearing for driving a shaft or spindle propelled by manual power, capable of running at two speeds, and arranged so that the operator who turns the crank can properly adjust and attend to the material and cause the several parts of the machine to work harmoniously."

It will be noted that in some respects the parts described are akin to those of State. Again, there were

"Automatic and hand-feeding devices, so arranged to the machine as to be easily controlled by the operator, to give vertical motion to the spindle when used for drilling."

There was also

"A shaft or spindle for holding the tool for performing the work, constructed and arranged in the machine so that it may be fed automatically or by hand, or by both, and so connected by a pinion to the crank that it can receive rotary motion independent of its vertical feeding motion, by means of which it is enabled to act as a screw cutter."

Certainly lack of automaticity did not affect this Court in that case.

As Judge McPherson said in *Burdett Co. v. Elevator Co.*, 196 Fed. 43, 46:

"The successive operation of the signals and of the motor is not a decisive objection; and the necessary intervention of human agency is equally unimportant. A device need not be wholly automatic before it can be protected by a patent, nor need all its movements be simultaneous. 'The test is whether there is a new unitary result, to the production of which the different elements co-act.'"

There are numerous authorities of similar import, a principal one being *Krell v. Story*, 207 Fed. 946, which discusses the question of human intervention at length and refers to numerous cases.

Defendant's "bight" theory. This point is to the general effect that in the State machine the rolls do not press the fabric against the core but are held away from it by centrifugal force in the folds or bights of the skirts. In an earlier chapter (p. 100), we have shown that it is entirely without foundation, not only by the testimony of several witnesses, but also on the numerous positive statements in the State specification to the contrary effect. It is beyond question that the action is precisely the same in the machines of both plaintiff and defendant.

Mechanical advance of carriage. In defendant's machine, the carriage is guided on a slideway, just as in the State machine, to ensure the uniform and accurate advance of the rolls on the sides of the core. In the State patent the means employed for moving the carriage comprise a screw and a hand wheel which is manually operated by the workman. In the Thropp patent there is a

similar screw and hand wheel, and in addition there are connections whereby the screw may be turned by power; either means may be employed at the will of the operator. Defendant's expert lays great stress upon the advantages in the mechanical operation. It is largely if not entirely upon this capability that he bases his claim that defendant's machine is automatic. In the carefully prepared demonstration of the Thropp machine, intended for the purposes of this litigation, the screw was rotated by power. While it is quite immaterial whether it be turned by hand or by power, it is interesting to note that in the actual and commercial use of defendant's machines the hand wheel, and not the power mechanism, is employed.

In order to investigate and settle this question, Ray (Vol. I, p. 562, Q. 105 *et seq.*) visited four tire factories using defendant's machine. They were the Lee factory at Conshohocken, Pa., the Racine factory at Racine, Wis., the Zee Zee factory near Trenton, N. J., and the Ajax factory at Trenton, N. J. Moreover, these four plants were the *only* ones he visited, so there can be no suggestion as to the suppression of unfavorable observation in other factories. The Thropp machines at these four places (Q. 109) were similar to that in evidence in respect to the devices here in controversy; and in each of these four factories (Q. 113), "the slide carrying the stitcher arms was *advanced manually in all cases*, the operator turning the hand wheel mounted upon the screw which feeds the carriage inward". This commercial practice, which is parallel to that of State, completely demolishes the claims advanced by defendant's expert as to advantages involved in the mechanical operation of the screw.

The receding angle. Defendant's expert states at several places, for instance, on page 275, Vol. I, that in the Thropp machine the rolls operate "substantially at

right angles to the surface of the core at all points and not at a receding angle". The allegation, even if correct, would affect only a few of the claims in suit, the others not being limited to the receding angle feature. But it is not correct. In the exhibition of its machine, and to make out the best case possible, defendant used the rolls at a receding angle (Vol. I, p. 72, x-Q. 119) until they "reached the maximum width of the core and began to move inwardly", when the workman adjusted them to a perpendicular condition. Even this would meet the terms of the receding angle claims, giving defendant the full advantage of its special demonstration. However, the rolls in actual commercial practice are employed *throughout* at State's receding angle, and defendant's patent indicates were intended to be so employed.

There is no doubt what the patent in suit means by the term "receding angle". The specification defines it at page 6, lines 33 to 36:

"* * * It will be noted finally that I mount the spinning-rolls with their plane not at a right angle to but to recede at an acute angle from the plane of the ring-core."

And it is shown in Figs 12^b and 12^c of the drawings. When this position is compared with that shown in Figs. 14 and 15 of the Thropp patent, it will be seen that the term means exactly the same in both cases, and it will also be seen that the rolls may be "at right angles to the surface of the core" and still be at a receding angle to the plane of the core. This is fully understood and realized in the Thropp patent, as even in its claims (for instance, 12 and 13) the forming-rolls are described as "arranged to engage the core at an angle to the plane thereof". There can be no doubt as to what defendant's intentions were.

And this intended angular inclination of the rolls is supported and confirmed by their actual use in commer-

cial practice. Ray testifies (Vol. I, p. 564, Qs. 114 to 116) that in all four factories the rolls stood at this receding angle to the plane of the core, "*during the whole time* that they were acting upon the fabric upon the sides of the core"; and that this angle "was not changed during the advance of the rolls". They were afterwards adjusted to a different angle to go about the bead, when the latter was placed over the already applied fabric, but that is immaterial to the facts under consideration. The commercial practice in forming the fabric to the sides of the core is exactly parallel to that of State.

In the earlier litigation, the Court of Appeals for the Sixth Circuit pointed out at length that the Firestone machine did not embody the roll at the receding angle as defined by State, and that it was really employed in a skewed position; what it meant may be more easily illustrated than described, and for that reason attention is directed to Plaintiff's Exhibit No. 13 (Vol. 2, p. 108), Fig. 2 of the drawings near the middle, wherein the roll 133 is shown in such a skewed position. In the present case, *the roll of the Thropp machine, and particularly in its commercial use, is set and employed in precisely the same way as that of State.* The Court of Appeals for the Sixth Circuit substantially admitted

"that in State's particular form of device with his spinning disc at its 'receding angle', and practically tangential to the core circumference at the point of contact, there will be enough 'hinging and folding' back over his tool to produce a friction which would cause more stretch than could the mere rolling advance of the disc in its helical path."

Roll pressing means. Defendant's expert also lays stress upon the fact that the means defendant employs for pressing the rolls against the core are different from those in the State patent, referring more particularly to the use of weights in place of springs, and to

the arrangement whereby the arms may be connected to a hand wheel and thus be forced in positively.

Ray observed the prior devices in the four factories he visited, and found that the method of employing them was different from that given by defendant in the special demonstration of its exhibit machine. *In three of these plants (Vol. I, p. 565, Q. 118), Lee, Zee Zee, and Ajax, the weights were employed to pull the forming-rolls against the sides of the core*, although the pressure was controlled manually by the operator, who could either increase or diminish it at will. This manual control is the same as that disclosed in the State patent, which, as before mentioned, provides the arms with the handles 142. The more complicated arrangement in the Thropp machine serves the same end, although it is questionable if it may be regarded as an improvement. But whether or not, the question is of no importance. As a matter of fact, hand-controlled devices are not referred to in the claims in suit.

In the fourth factory, Racine, the weights had been removed and the arms were pressed against the sides of the core by springs interposed between the disc and the outer ends of the arms. Here the operator controlled the compression of the springs by the hand wheel, but the final and effective pressure was given by the springs.

In other words, in commercial use defendant's rolls are pressed against the core by either weights or springs, which are subject to hand control, and the same was true even in the special demonstration of the Thropp machine. There is no possible escape along this line. *The State specification is explicit in saying (p. 6, lines 9 to 11) that he may use "not only springs and weights but other mechanical instrumentalities for pressing the spinning-rolls against the ring-core", with much more to the same effect.*

Stretch contention. Defendant's expert also makes an unavailing effort to escape by the allegation that in the Thropp machine the fabric is so greatly stretched circumferentially as to require little or no subsequent side-forming action by the rolls. This theory is met by the customary obstacle of hard fact. The contention in substance is that Thropp operates on the single (circumferential) stretch system, as distinguished from the State double (circumferential + radial) stretch system. For instance, he says (Vol. I, p. 273) :

"It thus appears that the fundamental idea of means upon which the Thropp machine is built is that of stretching the fabric so greatly at its centre as to very largely effect thereby the shaping of the fabric to the core."

He endeavors to support his presumption by extracts from the Thropp specification. These we have previously discussed and have set against them similar extracts from the State specification. Contrasting the two, it would appear that the intentions of the two patentees were the same.

Moreover, his theory is positively contradicted by the evidence of defendant's own witness, Curtis, who is an employé of one of the Thropp Companies at Trenton, his duties being to demonstrate the Thropp tire machinery and equipment. He testifies (Vol. I, p. 299) :

"x-Q. 66. What is the normal amount of stretch employed in originally attaching the ply to the core, in connection with the Thropp machine?"

A. We are using about *twelve per cent.* as a standard now."

He also says that the amount of stretch varies widely according to the particular company; but the *standard* is twelve per cent., which is exactly the same as the standard in the State machine, as already stated. This

testimony alone is sufficient to dispose of the single stretch contention.

Defendant's expert becomes further enmired as he proceeds. It is to be remembered that when the double stretch method is employed, there are radial diamonds in the bead portion, which is not the case when the single stretch system is used. He says (Vol. I, p. 279), in reference to defendant's machine, that he has "*never seen or been able to ascertain from anyone else that there is any distortion of the fabric meshes on the sides into diamonds having the longest dimension radial*", and that while he finds the elongation of the meshes on the tread due to stretching, he does not find "any radial elongation at any portion of the fabric." Incidentally, he does not say what tires he has examined, nor are any introduced in evidence, and as will appear later, he was not taken into the confidence of his client.

This alleged absence of radial diamonds he contrasts (Vol. I, p. 283, Q. 73) with the condition he saw in the fabric formed upon the core of State's first machine, Plaintiff's Exhibit No. 2, wherein he says that "in the portions of smaller radius the meshes appeared to have taken a diamond shape with the long axis radial. The change of form was slight but perceptible." In both the State and the Thropp machines, sufficient tension is applied to stretch the fabric circumferentially, and in the commercial use of both of these machines, an initial stretch of twelve per cent. is effected, after which the skirts are radially stretched by the rolls with the necessary production of radial diamonds. Plaintiff's expert (Vol. I, p. 72, x-Q. 117) says that the operation of the Thropp ring-core and spinning-rolls would necessarily produce the same result as in the Goodyear machine. But the proofs far transcend any such conclusion, however accurate it may be.

Ray made a special point of investigating this matter at the time of his visits to the four factories using the

Thropp machine. He says (Vol. I, p. 566, Qs. 119 to 124) that he observed the fabric as it was laid upon the side of the core and carefully noted its condition, and that he paid particular attention to the reticulations of the fabric in relation to radial diamonds. *Ray (Q. 122) actually saw, in each of these four factories, diamonds in the bead portion with the long dimension radial, and says that these radial diamonds were readily perceptible. This evidence, based on actual observation, completely offsets that of defendant's expert.* But that is not all.

Ray further testifies (Vol. I, p. 566, Qs. 125 to 133) that he *purchased on the open market* one of the tires of each of the concerns mentioned, viz., *Lee, Zee Zee, Ajax, and Racine*, and these *four tires have been introduced in evidence* as Plaintiff's Exhibits No. 30, No. 31, No. 32, and No. 33. He says (Q. 129) that *in all four* of these exhibit tires *there are diamonds with their long axes radial in the bead portion*; and to make this apparent he has removed certain outer portions of the tires, and has outlined the diamonds in pencil to make their angularity more appreciable to the eye. Of course, each individual diamond is small, but the pencil marks following the crossing threads clearly indicate their angular relation to each other.

These four tires are the only Thropp-made tires in the case. Defendant introduced none, and for obvious reasons. If they had been produced by circumferential stretch alone, there would be squares in the bead portion, as in the illustrative specimen, Plaintiff's Exhibit No. 34, previously mentioned. Apart from theory or speculation, the tires themselves demonstrate the use of the double stretch system exactly as in the first State machine and exactly as in the subsequent commercial machines.

Defendant's patent. In addition, the Thropp patent is conclusive as to the intention to embody double stretch in defendant's machine. After describing the

original or circumferential stretch, it says (p. 5, lines 59 to 63) :

"the disk forming rolls 132 engage the friction fabric on each side of the core at about the point where the fabric ceases to show its stretch due to the previous action of drawing it on the core."

Then it describes the action of the rolls on these unstretched portions, when it proceeds (p. 5, lines 85 to 91) :

" * * After the first sheet of fabric has been thus formed completely about the core by the stretching and about the sides of the core by the disk forming rolls, a second sheet of fabric may be drawn onto the core in a manner precisely similar to that already described."*

And it refers to the operation on this second sheet as follows (p. 5, lines 106 to 111) :

" * * After this second strip has been thus stretched on the periphery of the core superposed on the first strip of fabric, it may be formed down about the sides of the core by the disk forming rolls 132 as previously described."*

There is much more to the same effect, but enough has been quoted to indicate that the skirts of the fabric are formed to the sides of the core in the same way as in the State machine, and to refute the expert theory that circumferential stretching alone is employed.

The only difference between the disclosures of the two specifications is that defendant's patent refers to "forming" the fabric on the sides of the core by the rolls, while the State patent refers to the same action as "shaping" the fabric on the sides of the core.

Even the Thropp claims indicate the similarity of operation. There are 148 of these, and in them the rolls are referred to as "rolls", "elements", "devices", etc. In

145 of the 148 claims, the rolls, however identified, are stated to be for "forming" the material on the sides of the core, or the like; and in the other 3 claims the language is substantially equivalent. In 31 claims the rolls are recited as "forming-rolls", and in 43 claims as "forming elements". 34 claims refer to the initial stretching, and then attribute the "side forming" action to the rolls.

By way of comparison, in each of the State claims in suit, Nos. 4, 5, 6, 7, 22, 23, 24 and 25, the rolls are described as to pass "radially along the sides of the tire-shoe to shape the sheeted fabric on the core," or in language of similar import; and in claims 12, 13 and 26, they are described in substantially the same way.

Thus, in addition to the proved facts, precise similarity of function is asserted and described in the specification and claims of both plaintiff's and defendant's patents. There can be no doubt of the use of the double stretch system in each machine. There is no foundation for the alleged use of the single stretch method in defendant's machine. Further, many of the claims of the Thropp application when pending in the Patent Office were rejected on the State patent, even though the application was for a supposed improvement, as will be apparent from a review of the official actions in its file wrapper, Plaintiff's Exhibit No. 15. This indicates that the Patent Office also realized the closeness and pertinence of the earlier State structure to that of Thropp.

In parallel circumstances, when comparing the patents of plaintiff and defendant, respectively, the Court held:

"As already stated, both the Quinn and the Ames patent do the same work in substantially the same way, and achieve the same result. The same principle is apparent in both, and is worked out on the same lines. When this situation is disclosed, infringement is disclosed." *Refrigerator Co. v. American Co.*, 171 Fed. 416.

Core speed contention. Defendant makes the argument that the Court should not permit the speed of rotation of the core to be taken as a determining element. The proofs already reviewed show that below 80 R. P. M. State's beneficial effect is not attained, whereas it is attained at 120 R. P. M. There is no dispute about this. But defendant says that it would be wrong to say that a machine infringed at the higher speed if it did not infringe at the lower one. *To which the answer is that the proofs also show that defendant employs the higher speed and not the lower one. Nor is there any indication by defendant that it is willing to employ the lower speed, and for the obvious reason that the machine would then be useless.*

It might be contended just as logically that a patent on an aeroplane or a hydroplane could not be infringed because its motor might be driven at a speed lower than that required to make the plane fly; or that a patent on a high tension electrical apparatus could not be infringed because it might be uselessly employed with a low tension current. Illustrations of this general character may be multiplied almost indefinitely.

Nor is this the first time that high speed has been important in a machine combination, as for instance in cream separators, gyroscopes, centrifugal casting machines, centrifugal oiling systems, and the like, in none of which the apparatus would be useful at low speed. In a comparatively recent case, *Ottumwa vs. Christy*, 215 Fed. 362 (C. C. A., 8th Cir.), involving an apparatus for loading coal into cars, the older devices were dispensed with and in place thereof was substituted a carrier "*moring at great speed*" which caught the coal and *threw it by momentum* to its destination. The high speed carrier was "*the chief element*" of the arrangement. The opinion states (p. 369):

"It is claimed that Christy's combination and these claims are anticipated by the prior state of the

art. It is not claimed, and it is probably not true, that any of the mechanical elements of which Christy's combination is composed is new, and this, like most modern patents, is a patent for a new method of combining old mechanical devices. But a new combination of old elements, whereby a new and useful result is produced, or an old result is attained in a more facile, economical, and efficient way is as securely protected by a patent as a new machine or composition of matter."

Again it says (p. 374) :

"The defendant has not omitted to make another attack upon Christy's combination, which is generally made upon every patented combination, and that is that it is a mere aggregation of old elements and not a combination subject to patent. It is true that there is no invention in the mere assembling of old elements into an aggregation in which each element performs its own independent function only and in which no new principle or mode of operation or new result is produced. But Christy's combination of elements was new; it was not disclosed in the prior art; no one had ever made it before him. The independent functions of his various elements were modified and extended by his combination so that together they operated on a new principle and by a new mode and produced a new and better result."

Other Defenses.

The two alleged anticipations principally relied on by defendant are the prior practice of hand spinning and the Mathern Belgian patent. The first of these has been treated early in the brief. The second will presently be discussed. It seems desirable first to dispose of a few other patents set up by defendant.

Minor Defenses.

Several patents are presented by defendant's expert, although it is believed rather as indicating the state of the art than by way of anticipation. These will be briefly discussed.

Hernandez patent. The French patent to Hernandez, Defendant's Exhibit P (Vol. 2, p. 313), was granted January 8, 1909, and published March 19, 1909. Quite apart from the fact that its subject matter is not relevant, it is not early enough in point of time, as State's first commercial machine was set up and used in the spring of 1908.

Matherne German patent. This German patent, Defendant's Exhibit O (Vol. 2, p. 305), was filed December 20, 1906, but is stamped *Ausgegeben* January 26, 1909. In addition to its lack of pertinence otherwise, it is too late in date.

Vincent patent. The Vincent U. S. patent No. 794,473, Defendant's Exhibit J (Vol. 2, p. 245), has been already mentioned on page 15. Defendant's expert admits that it proceeds along the single-stretch system. He says (Vol. I, p. 254, Q. 43) :

"It differs however from the Matherne machine or the State machine in that it has only one speed. This is because it stretches the fabric so nearly to the final shape that spinning rolls are not necessary."

After the fabric is thus pre-formed by circumferential stretching, it is applied and cemented by little hammers that pat it against the sides of the core. These hammers (Vol. I, p. 482, Q. 69) are arranged at different distances from the axis and have no radial movement. They do not

stretch or form the fabric in any way. There is no out-flying of the skirts (Q. 70) for two excellent reasons,—in the first place, even if there were centrifugal force, the hammers would prevent it, and in the second place, the speed is too low to cause centrifugal force. The hammers do not effect any change in the fabric reticulations. All this had been attended to in the original stretching.

Seiberling & Stevens patent. The U. S. patent to Seiberling & Stevens, Defendant's Exhibit K (Vol. 2, p. 257), has already been discussed at length, as the one under which the Goodyear Company began its earliest development (p. 14). It was in the double-stretch class; the fabric was first stretched on the core in its tread portion by suitable tension devices; and reciprocating jigger fingers were next employed in an endeavor to stretch, shape and apply the skirts to the sides of the core. These jigger fingers proved ineffective and the machine was junked. Moreover, the highest speed of this machine (Vol. I, p. 307, Q. 35) was only about 30 R. P. M. There was no possibility of throwing out the skirts by centrifugal force because of this low speed, and in any event the jigger fingers would have prevented such an effect. The patent also shows certain creasing or stitching rolls (Fig. 4) whereby the fabric was "tucked into a crease which exists near the lower end of the core and forced there with considerable pressure." These creasing rolls 91 (Vol. I, p. 484, Q. 74) were "sharp edged", and are clearly distinguished from State's rolls with rounded edges. This alone would have incapacitated them from any forming action on the sides of the core. Further, Fig. 4 shows that the effect of lifting the connected handle would be to carry them out of contact with the core, since due to the proportions the left-hand roll rises twice as fast as the right-hand roll. The jigger fingers were the side-forming devices and the only side-forming devices. Not only was there no centrifugal force but there was no hinging and folding action.

Moore patent. The Moore U. S. patent, Defendant's Exhibit L (Vol. 2, p. 273), presents mechanism which differs radically from that disclosed in State. It was designed to make *bicycle* tires and does not deal with flat fabric at all, but with a fabric which is *already woven into the desired shape* and conforming to the contour of the exterior of an expandible shell, as disclosed in the specification. No forming was necessary, although after it was placed on the expandible shell, the latter was expanded to stretch it. If it can be classified at all, it was in the single or circumferential stretch class. Generally speaking, the shaped fabric was cut into lengths and joined together at its ends so as to form a ring or endless band which was then placed on the shell and stretched by expanding the latter. Cement was then applied and the fabric allowed to dry and set. After this drying process, various other operations were gone through, one of which was to act on the wings which projected outwardly from the fabric and to turn them over on the body of the fabric and cause them to adhere to the fabric body. For this latter purpose, certain rolls were employed, and as they turned or *spun* on their axes, they might be termed "spinning rolls" in the latter sense. To indicate the totally different mode of operation, plaintiff's expert (Vol. I, p. 486, Q. 77) discusses at length the fifteen consecutive steps employed. This description is too long to detail here.

Moore certainly does not have the hinging or folding action of State, nor the use of centrifugal force to throw out the skirts wrinkle-free, nor any other steps of the State procedure. The only possible similarity is that the machine was equipped with a variety of rolls to be used for various purposes, as shown in Fig. 1. There is no forming or shaping to the sides of the core, for Moore's fabric is already shaped, and there is no re-arranging of the reticulations, for the cords were arranged in proper position by the previous weaving.

Jeffery patent. The Jeffery U. S. patent, Defendant's Exhibit M (Vol. 2, p. 285), illustrates a machine for making a bicycle tire and provided with a cylindrical drum which is etched on its surface with shallow grooves, the fabric, in the form of an endless ring, being pressed into these grooves by a sharp edged roller. This is so unlike the State mode of procedure (Vol. I, p. 489, Q. 79) as hardly to require discussion. It is not even referred to in defendant's brief. Whatever the speed of rotation of Jeffery's wheel, the fabric maintains its close relation to it. There can be no throwing out of the unattached skirts of the fabric since there are no such skirts. There is no stretching of the fabric radially against the side of the ring-core.

Bayne & Subers patent. The machine of the Bayne & Subers U. S. patent, Defendant's Exhibit N (Vol. 2, p. 291), not only does not deal with a flat woven fabric which it shapes to the core, but does not act on a fabric at all (Vol. I, p. 491, Q. 81). It handles threads or cords which it winds upon a core. For this purpose it utilizes three sets of grooved wheels, called "director wheels", over which the prepared threads are designed to run. This patent has now been dropped, but just why it was ever referred to is difficult to understand. The only point of interest is involved in the suggestion of defendant's expert that "there is no apparent reason why by simply rotating the machine in the *opposite* direction so that the wheels 19 would progress radially from without inwards (instead of in the reverse direction as when laying on the cords) the machine would not readily spin the fabric of a fabric tire smoothly down against the core". What this would imply is that by acting upon a fabric instead of upon the cords; by operating the machine in the opposite direction; by rotating the core fast enough to cause the fabric to fly out by centrifugal force; and by changing the contour of the grooved director wheels so

as to have rounded edges; an expert with his present knowledge could convert the Bayne & Subers machine into a State machine. The analogy is far fetched. Anticipations are not to be created by phantasmic speculations of this sort.

Metal spinning. The three U. S. Letters Patent, one to Dewey, and two to Seymour, Defendant's Exhibits Q, R and S, are referred to by defendant's expert as disclosing the art of metal spinning, but apparently are no longer relied upon, since no mention is made of them in defendant's brief. There is no analogy whatever therein to the shaping of flat fabric to a curved surface by stretching it and changing the shape of the thread reticulations. The word "spinning" is apparently what captivated the fancy of defendant's expert, and indeed the verbal similarity seemed to impress the Court of Appeals for the Sixth Circuit. However, both the mode of action and the results are totally different. Even defendant's expert admits different meanings in the use of the word "spinning", he first referring to its significance in the textile art in the forming of yarns. But that is a single isolated instance (Vol. I, p. 493, Q. 83). In addition to the spinning of yarn, and the spinning of metal, there is the spinning of tops, and the spinning of the State rolls ("they revolve at high speed", State specification, p. 5, line 95). In each there is the common employment of speed in the rotating of the spinning device; it is because of this speed that the word "spinning" in each instance is employed.

But in metal spinning, the metal is made to flow,—that is, it is displaced from one position to another. The metal cannot be changed greatly in shape unless it is repeatedly reheated, or unless it is maintained hot. There is nothing in metal spinning at all analogous to the action of the State forming or shaping roll.

The Dewey patent (Vol. 2, p. 319) is a fair example. It refers to the repeated annealing of the metal, and to

the necessity for preserving its malleability. He says that it is his purpose "to keep the metal annealed or in a softened condition during the greater part of if not the entire or complete formation of the article and to decrease the number of molds as well as the number of pressings usually required in forming or shaping the article". It is *because of this heat treatment* that he is enabled to change the shape of a sheet of metal and to decrease the number of molds, etc. In this particular instance he keeps the metal soft by the use of an electrical heater. Defendant's expert would imply that the sheet of metal stands out straight because of centrifugal force. This is obviously unfounded, since the metal though heated is still stiff, and not in the fluid condition which would be necessary to permit centrifugal force to act on it. By way of *reductio ad absurdum*, it may be pointed out that State does not heat his fabric to any such temperature as would be required to render metal semi-fluid, whether by electrical heater or otherwise.

The two Seymour patents show the prior sort of spinning to which the Dewey patent refers, in which only a limited amount of shaping of the metal can be produced without reheating. For instance (Vol. 2, p. 323), Exhibit R illustrates, in Fig. 6, a conical former whereby the metal is first shaped, and the specification says concerning it that it "may be used for giving shape to the article to be made in its first stages." That is to say, by several stages the metal is shaped to fit this former, and finally the shape is to be changed to that indicated by the former in Fig. 1, this last shape being given by the tool *t*.

The remaining Seymour patent (Vol. 2, p. 327), Defendant's Exhibit S, as shown in Fig. 1, starts with a previously formed cylindrical shell *D* with a hemispherical end, which end is clamped between the rotary mandrel *B* and the chuck *C'*. This shell is not shaped upon any core but is bent inwardly to the position indicated by the

dotted lines in Fig. 1. The specification refers to this operation at page 3, lines 29 to 40.

These instances show adequately that a number of different stages of action were required to get the metal article into final shape, just as the subsequent Dewey patent says was the case prior to his invention. This heat treatment and shaping of metal bears no resemblance to the forming of a flat fabric upon a ring-core, first by longitudinal stretching and then by radial stretching, as in the patent in suit. The only possible similarity is the verbal one involved in the term "spinning," which has many meanings. Even assuming there were some analogy, and it is not conceded for a moment, between the flowing of metal on a mandrel by repeated operations, and the shaping of a fabric on the sides of a core by a single operation, the new use and application of such a roll by State would be well supported under the doctrine promulgated by the Supreme Court in *Potts v. Creager*, subsequently noted.

Mathern Belgian Patent.

As this patent requires extended examination, it is perhaps better to make a general statement concerning it at the outset. It was not set up in the answer in the *Firestone* case, nor advanced before the lower Court. It was an unpublished patent and was not discovered until the case was before the Court of Appeals for the Sixth Circuit, when by stipulation and at the Court's request it was submitted for consideration. The Court did not hold it to be an anticipation, but used it simply as confirming the theory of aggregation, as will be pointed out later on.

It is purely a *paper* patent. *No machine was ever built under it.* It happened to have a roll which the Court

dubbed a "spinning-roll". It was not a spinning-roll like that of State, except in the sense that all rolls spin; State's specification (p. 5, line 95) says "they revolve at high speed". It was intended for a totally different purpose, namely, to eradicate pre-formed puckers and wrinkles *after* the fabric had been formed and cemented to the core. The patent shows the real forming and cementing means, and these other means are distinctly described as possessing the pre-forming and applying functions. There is no word in the specification describing or even applying any such functions for this roll. There is no reference to any forming effect by it or to centrifugal force. On the contrary, the roll is distinctly stated to be for the purpose of passing over the wrinkled fabric after it is formed and attached to the core.

The patent states that the fabric is first stretched circumferentially and pre-formed and is then cemented to the core. This circumferential stretching immediately places the Mathern arrangement in the *single-stretch class*.

The idea of subsequently removing wrinkles from already applied fabric (and this was a common plan in the earlier days) was impracticable. *Within a few months after his Belgian application, Mathern filed one in Germany, and in this latter case he abandoned the roll and substituted something quite different for it.* And *in the commercial machines which some time later he introduced into use, the roll did not appear, and he used in place thereof the new devices first appearing in his German patent.* In both this machine and in the German patent *he retained the stretching and applying devices* of the Belgian patent, which retention emphasizes the omission of the roll on which defendant now relies.

It must not be overlooked that the roll never appeared in metal until it was made for the purposes of litigation, and attached to defendant's model in evidence.

Nor is there any presumption of operativeness or validity flowing from the grant of the Belgian patent. Belgian applications were not subjected to exhaustive investigations as are American applications. Section 2 of the Belgian grant specifically states that it is delivered without previous examination, and without guaranty of the merit of the invention, or even of the exactness of the description. *And as a further indication of the worthlessness of the roll, the Belgian patent was allowed to lapse immediately.* Mathern did not even regard it as worth the twenty francs required as a first annuity to keep it alive. *Still another indication of its uncertain standing is in the fact that there is dispute as to the correctness of defendant's translation.* As will be subsequently shown, the authorities are strongly to the effect that in circumstances like these, an earlier patent, and especially when a foreign one, is without anticipating effect.

The principal complicating feature is that defendant produces a model alleged to embody the Belgian devices. It must be borne in mind that this exhibit is a model and not a commercial machine. The photographs appearing on pages 110 to 112 and elsewhere in defendant's brief were made from this exhibit model and are by no means representative of the machine actually disclosed by the Belgian patent. *It is a simple matter to take an early device and, in the light and knowledge of a later one, to change its construction and mode of operation so that it will act in the later way.* As plaintiff's expert Browne appropriately remarks (Vol. I, p. 461), the model, Defendant's Exhibit H, by emasculating the actual forming devices, and by making various other changes, can be operated to produce tires with the State mode of operation. But no anticipating effect can be presumed there-

from. Courts do not permit the revamping of an old structure in the light of modern art and then using it for purposes of anticipation:

Diamond Rubber Co. v. Consolidated Rubber Tire Co.,
220 U. S. 428:

"Knowledge after the event is always easy, and problems once solved present no difficulties, indeed, may be represented as never having any, and expert witnesses may be brought forward to show that the new thing which seemed to have eluded the search of the world was always ready at hand and easy to be seen by a merely skilful attention. But the law has other tests of the invention than subtle conjectures of what might have been seen and yet was not. It regards a change as evidence of novelty, the acceptance and utility of change as a further evidence, even as a demonstration."

McMichael v. Ruth, 128 Fed. 706:

"The fact that an expert, with a patent before him, might be able to build up the structure covered thereby, by selecting and adapting appliances theretofore known, does not overcome the presumption of invention arising from the granting of the patent, where neither the same combination in its entirety nor the same mode of operation had previously been described or known."

National Co. v. Belcher, 71 Fed. 876:

"Evidence by a trained mechanic that by following the suggestions of a prior patent, in respect to the duplication of the device therein described, he produced without difficulty a device substantially identical with that of the patent sued on, is not to be lightly accepted, since, being acquainted with the present art, he would naturally follow the suggestions thereof, or perhaps introduce suggestions of his own mind."

The translation. There is serious dispute as to the translation. On the face of the patent, the intended operation was the circumferential stretching of the fabric and other simultaneous pre-formation, and then its cementing to the core. This left *wrinkles* and it was Mathern's idea to eradicate them by the roll in question. The principal point of conflict is concerning certain kindred French words like *déplissement*, *déplissage*, *déplissé*, and the like: In the translation introduced by the defendant in the *Firestone* case, these words for the most part were translated as "unwrinkling", etc. (Vol. I, p. 460, Q. 47). This did not suit defendant here, and for obvious reasons. Defendant's Exhibit F prefers "pucker" to "wrinkle", and the latter word does not appear at all.

Plaintiff's translator is Professor Spiers of Columbia University, and in charge of French instruction at that college (Vol. I, p. 519). He says (Q. 5) that the first and correct translation of words like "*déplisser*" is to *unwrinkle*, etc., and he proceeds (Qs. 6 and 7) to give its derivation and the reasons for his statement. He testifies (Q. 8 *et seq.*) that "unpuckering" and the like are not proper if the French words be taken at all strictly. This is in direct opposition to the testimony of defendant's translator.

It may be noted also that Professor Spiers is of French descent and a member of the Spiers family, who are the authors of the well known French dictionaries, Spiers' Dictionary, Spier & Surette's Dictionary, etc. On the other hand, defendant's translator (Vol. I, p. 209, x-Q. 11) is of Italian descent and (Vol. I, p. 208, Q. 3) received his education in French in the department of Columbia of which Professor Spiers is the head. There can be little question as to the weight of authority, and

particularly when considering the circumstance that the earlier *Firestone* translation freely used the words "wrinkle", etc.

Thus, from the outset the foundation of the entire fabric is shaky. But there is no room for uncertainty when questions of anticipation are being considered. As the Supreme Court said in the leading case of *Coffin v. Ogden, infra*, referring to defendant:

"The burden of proof rests upon him, and every reasonable doubt should be resolved against him. * * * The law requires, not conjecture but certainty."

In a very recent case, *Permutit v. Paige*, 292 Fed. 439, a similar situation arose, and Judge Learned Hand said as follows:

"The defendant's translation renders the last clause, 'at a height of one-third to one-half of a meter.' About this clause the learned doctors disagree, and it seems to me quite enough to say that the disagreement is honest without trying to solve it, which would be quite beyond my powers. To be a valid anticipation greater clarity is necessary, else there is no adequate warrant that the art was enriched. Read in connection with the earlier practice, this article did not to my mind clearly enough show the necessary departure. The law is not friendly to efforts like this to spell out a later invention in the light of what it has itself disclosed."

Other authorities to the same effect will be noted later on.

As to the word "pucker", plaintiff's expert (Vol. I, p. 510, x-Q. 133) says that he does not quarrel with its use as indicating the *original* condition of the skirts of the fabric after it has been circumferentially stretched.

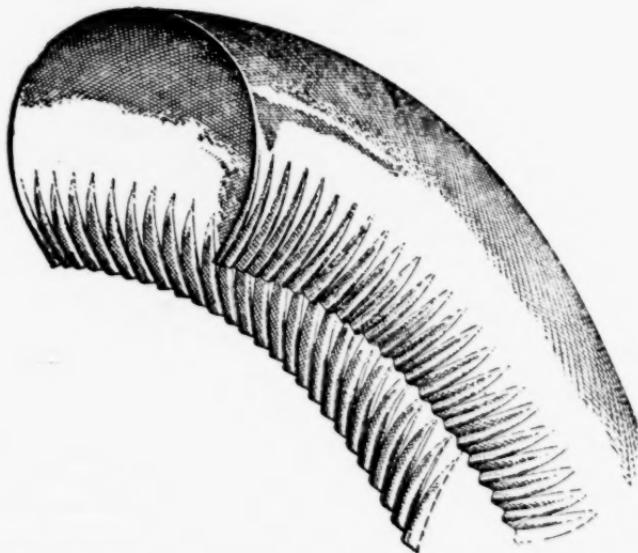
It is only when this puckered fabric is cemented to the core that the puckers are converted into wrinkles, and these Mathern hoped to eliminate by the use of the roll on which defendant now relies.

Mathern's general plan. A careful perusal of Mathern's specification leaves little doubt as to his intention. His thought was to pre-form the fabric entirely, then cement it to the core, necessarily leaving wrinkles, which wrinkles he meant to eliminate with the tool of Fig. 6,—the roll set up as an anticipation of State's forming-roll. The idea of effacing wrinkles already formed on the core was poor and impracticable, but at the same time one in vogue in the early days. For instance, the Stevens patent, application filed April 12, 1913, Plaintiff's Exhibit No. 13, describes the general scheme and condemns it:

"Heretofore, machines have been constructed in which the tread-portion of the tire-fabric has been overstretched in order to cause the ply to conform roughly to the contour of the core and to reduce the amount of fullness or surplus in the fabric to be cared for or absorbed at the sides of the core, but in the use of these devices, in addition to the objectionable and weakening excessive stretching, wrinkles and other defects have occurred in those portions of the fabric applied to the sides of the core, dependence being placed upon a *subsequent* elimination of such wrinkles, either wholly or partially. The resulting detrimental effects of these defects thus occurring are not, however, completely overcome by the subsequent removal or smoothing out of the wrinkles or folds."

Mathern was on the same wrong track. Briefly summarized, he used spherical rollers 26 and tension mechanism to elongate the ply circumferentially, and gears 36 to pucker its edges. What he hoped to accomplish by

this pre-forming operation will perhaps be more clearly understood from the accompanying sketch than by mere



description. Assuming that he started with a strip 88 inches in length, his purpose was to elongate the tread portion by the spherical rollers 26 to 100 inches, and by means of his corrugating gears 36 to contract or convex the bead portion to 76 inches. It will be understood that these particular dimensions, in fact the entire example, are employed solely for purposes of illustration. Then, when the fabric was thus pre-formed, he applied or cemented it to the sides of the core by a pair of rollers 30, which reciprocated in much the same way as the earlier jigger fingers of Seiberling & Stevens. This necessarily produced wrinkles and stuck them to the core, and to eliminate the wrinkles or smooth them out he employed the tool of Fig 6, which he caused to pass over the entire fabric, starting it at "the top of the core" and causing it

"to descend progressively on the side of the core and all the way down to its base".

It is a simple matter now for those skilled in the art to point out that wrinkles cemented to the core could not be effaced in this way. But Mathern was not the only one to think it possible, as indicated by the quotation from the Stevens patent. That the plan was an entire failure is shown by the fact that he immediately abandoned the tool of Fig. 6, and in his German application a few months later he substituted something else for it, although he retained the stretching rolls 26, the corrugating gears 36, and the reciprocating cementing rollers 30. And when he put out his commercial machine four or five years later, he similarly left out the tool of Fig. 6, although he retained in it the stretching rolls 26 and the cementing rolls 30. The abandonment is further corroborated by his allowing the Belgian patent to lapse through his failure to pay the first annuity of twenty francs. And yet this tool of Fig. 6 is now set up by defendant as an anticipation of State's roll.

Plaintiff's expert describes the construction and mode of operation of the Mathern Belgian patent (Vol. I, p. 461, Q. 49).

The stretching rolls. The fabric is wound on a drum 18 and its tension is regulated by suitable braking mechanism to control the stretch. The middle portion of the fabric passes around the rolls 26, and these produce "*a slight lengthening of the middle of the fabric*". This accomplishes the original circumferential stretching. It will be understood that the quotations here and further on are from defendant's translation, irrespective of its accuracy.

The gears 36. Alongside the rolls 26 are the conical gears 36, one at each side of the fabric, whose "sole purpose", the specification says, is "*to produce a slight*

uniform puckering of the fabric strips at their edges, ensuring in advance a uniform contraction of the fabric at all points". This attempted result is graphically shown in our previous cut. The combined effect of the rolls 26 and gears 36 in pre-forming the fabric, by stretching it at its middle and gathering it at its sides, is also referred to in claims 2 and 8 of the Mathern patent. Claim 2 specifies "a set of gears and of spherical rollers for producing a uniform lengthening and convexing of the fabric, thereby facilitating the sticking of it to the core". And claim 8 refers to winding the fabric strips on the core "after a preliminary lengthening and convexing".

The specification says, after referring to the pre-forming:

"Next the fabric is placed on the core, which is coated with a layer of rubber solution so that the fabric adheres well to it and may be pulled along by its rotary movement."

As the strip is under tension, the effect would be to shape it still further to the periphery of the core and to cement its tread zone thereon. While the fabric is thus being wound upon the core the reciprocating rolls 30 are at work for the purpose of applying and cementing it to the *sides* of the core.

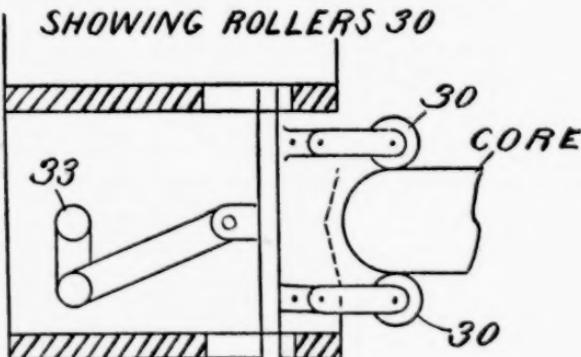
The Rolls 30. The action of these rolls is referred to at four places in the specification:

"As the fabric is pulled along and unwound from the drum 18 it encounters the rollers 30 on the casing 28. This casing 28 encloses a vertical bent shaft 33, which actuates a slide 32, that is guided in the walls of the casing 28. This slide 32 carries two rods 31 at two joints. Each of these rods carries at its ex-

tremity, a roller 30, which advances and retracts on the core, so as to stick to its straight or convex sides the fabric which has just been placed there."

MATHERN BELGIAN PATENT

SHOWING ROLLERS 30



The function of the rolls is clearly to "stick" the fabric against the sides of the core, whatever its shape may be.

Again :

"* * * (b) of the principle of rollers 30 advancing and retracting in a radial direction while bearing on the core for *cementing the fabric on its sides*."

And in claim 3 :

"* * * a device consisting of one or more sets of rollers carried by a carriage which receives, through a bent shaft, a reciprocating movement perpendicular to the axis of the core in order to *stick the fabric on the sides of the core*."

And in claim 8,

"* * * (b) *sticking the fabric on the sides of the core*."

Thus, the middle zone of the fabric is caused to adhere to the periphery of the core as the fabric is wound on it, and the reciprocating rolls 30 cause its skirts to stick to the sides of the core. Defendant reads the foregoing passages as meaning the "*central side portions*" of the core (p. 30 of its brief), but as will be apparent, no such qualification appears in the patent itself.

The specification says nothing about the speed of the core during the application of the fabric to its periphery and sides, but it must be slow to permit the reciprocating rolls 30 to act effectively in applying and cementing the fabric thereon. He does not even illustrate or describe means for rotating the crank shaft which reciprocates the rolls 30. This shaft might be rotated by hand, in which event the winding of the fabric would be extremely slow in order to enable the reciprocating rolls to perform their office.

The result of the actions up to this point is to apply the fabric to the core with wrinkles, etc., in it, and these wrinkles or puckers have been intentionally made at its sides by the conical gears 36. And wrinkles exist also in other portions of the fabric, inevitably so if the pre-forming rolls 26 are of the shape shown in the drawings. Mathern then proceeds in his attempt to remove these wrinkles by the employment of the tool "shown in Fig. 6".

The Tool of Fig. 6. This tool is *loosely suspended upon the pin 35* projecting from the vertically-fed tool carrier 17. Its sole described function is to unrinkle the fabric or to remove the wrinkles or puckers therefrom. This action is referred to in four places in defendant's translation:

"On the support 17, which constitutes a tool carrier, there is mounted a tool like that shown in Fig. 6, which has a fork with a rounded roller set at an angle. The sliding tool carrier 17 is adjusted so that the roller comes to the level of the top of the core.

Then the machine is set in operation and the roller is caused *to descend progressively on the sides of the core and all the way down to its base*. Thus there is obtained the complete and rapid removal from the fabric of the puckers, the descending motion being produced automatically by the pawl 34."

Of course, two of these rollers may be employed simultaneously, but their action is *over the entire surface* of the fabric from * * * "the top of the core" "down to its base". It was Mathern's intent by this comprehensive action to remove all puckers and wrinkles, wherever located in the fabric. Again:

"* * * (c) of the principle of the roller descending progressively on the core during rapid rotation and producing a progressive removal from the fabric of the puckers by eliminating the puckers from the point of their origin, this being performed in a single descending movement."

This means that each pucker or wrinkle is acted upon at the point where it begins by the roller which operates throughout the fabric as far as the pucker extends. Claim 4 of the Mathern patent specifies:

"a tool carrier having rollers and arranged to move downward automatically and progressively, dependent on the rotation of the core, in order to progressively *efface the puckers* of the successive strips of fabric."

Finally, claim 8 specifies:

"(c) *eliminating the puckers formed.*"

It may be noted again that the *sole office* of the rollers of Fig. 6 mentioned in the Mathern specification is the *removal or elimination of wrinkles or puckers* which are present in the fabric after it has been applied and cemented to the core. *There is no reference whatever to the*

tool of Fig. 6 as possessing any applying or cementing function. On the contrary, such function is ascribed, and ascribed only, to the previously employed rolls 30. Even without other considerations, this in itself is entirely adequate to differentiate the tool of Fig. 6 from the State roll which *simultaneously shapes the fabric and applies it to the core.*

Mathern refers to a fast rotation of the core during the action of the tool of Fig. 6, but this arises from the fact that the attempted removal of the puckers would be intolerably slow if the core were rotated at the same slow speed as is employed when the fabric is drawn on to the core and cemented thereon by the rolls 30.

Different State mode of operation. The described action of the Mathern devices is strikingly unlike that disclosed in the patent in suit. State does not pre-form his fabric and he has nothing at all resembling the spherical rollers 26 or the gears 36 of Mathern. State does not cement the skirts of the fabric to the sides of the core as the fabric is drawn on to it, and he has nothing like Mathern's reciprocating side-cementing rolls 30. Mathern *intends to put puckers into* the sides of his fabric by his conical gears 36 and it was his subsequent endeavor to remove or efface the wrinkles by the tool of Fig. 6. After State has stretched the fabric on the core and when his spinning-rolls are brought into action, the skirts are free and loose and baggy in order that the spinning-rolls may act upon smooth surfaces of the fabric, and the core is rotated at sufficiently high speed to spread the skirts out and away from the core by centrifugal force. Then, the carriage for the spinning-rolls is fed radially inward and the rolls act upon the progressively formed hinges of the skirts, so that the skirts are shaped, formed and cemented to the core as the result, exclusively of the action of the spinning-rolls during the high-

speed rotation of the core. *How absurd for Mathern to supply conical gears to put puckers into the fabric and thus contract it, if immediately thereafter, as the defense asserts, he is going to use centrifugal force to expand the fabric and throw it away from the core!* Why does defendant adopt a theory of operation which takes all the utility out of the puckers when Mathern takes such pains to assign utility to them?

Operation of model (Vol. I, p. 460, Q. 48). Of course, in the light of the present knowledge of tire-making on the State machines, it is now possible to take the machine of the Belgian patent, remove the puckering gears 36, or so use them as to be ineffective to perform the office which the patent sets forth; remove the side-applying and cementing reciprocating rolls 30, or so employ them as to perform no useful office; stretch the fabric on the core so that it is only applied to the tread zone; and run the core during the spinning down of the skirts at such high speed as to maintain them in an unwrinkled condition where the forming-rolls act upon them. Could the machine be so used, then a workman sufficiently skilled to handle the rolls shown in Fig. 6 could produce a useful tire carcass upon the Mathern machine. And that is exactly what defendant has done, and it is exactly the practice which has been proscribed by the Courts in the cases before cited.

The fatal thing,—the self-destructive feature,—is the suppression or emasculation of the fluting gears 36 and the cementing rollers 30. Defendant's expert is forced to allege with regard to the former that they do not have "any important or essential function", and as to the latter that the machine will operate "satisfactorily with the action of the rollers 30 omitted". He makes these statements gravely, although confronted with the very precise description in the Belgian specification and even in the claims of their functions and importance; and although

in the immediately succeeding German patent Mathern *retains* the gears 36 and rollers 30 which defendant's expert says are useless, and *discards* the tool of Fig. 6 to which defendant's expert ascribes all the merit.

Defendant's specific contentions. Defendant's treatment of the Mathern patent involves a number of untenable and unjustified assumptions and contentions, some of which will be next examined.

There is no authority (Vol. I, p. 469, Q. 51) for the assumption of defendant's expert that the low speed of the Mathern machine may be 4, 6, or 8 R. P. M. and the corresponding high speeds 81, 121½ and 162 R. P. M. The only information Mathern gives is that there are two speeds and that the high speed is twenty and one-quarter times that of the low speed. *If the low speed were 1 R. P. M. then the high speed would be 20½ R. P. M., and Mathern's low speed cannot be much greater than 1 R. P. M. to give the rolls 30 time to cement the skirts to the sides of the core.*

There is no authority (Vol. I, p. 469, Q. 52) for the statement of defendant's expert that Mathern's patent discloses spinning or stitching rolls. State's rolls act upon the centrifugally thrown out skirts and form, shape and cement them to the sides of the core, and have no office at all of removing wrinkles or puckers from an already applied fabric. Whereas, the Mathern specification nowhere refers to any shaping, forming, or cementing action of the roll of Fig. 6, the only office ascribed to it being the removal of wrinkles or puckers.

There is no authority (Vol. I, p. 469, Q. 53) for the assumption of defendant's expert that the patent discloses automatic means for feeding the rolls inwardly. While it has the mechanically fed tool carrier 17 with a laterally projecting pin 35, *the tool of Fig. 6 is merely suspended on this pin.* He admits himself "that they merely hook over" the pins and "*are guided and pressed to the work*

by the hand of the workman", and "that if they encounter an obstacle while being positively fed downward, they simply *lift* from their pivots". The workman performs the act of feeding the tool downward as well as of pressing its against the core, and the only function of the slide 17 and pin 35 is to prevent him from feeding it too fast. There is no "automatic means for feeding" the rolls in this, or in fact any feeding means at all.

There is no authority (Vol. I, p. 471, Q. 54) for the statement of defendant's expert that the slide which carries the rolls 30 is moved only "a short distance" back and forth. The crank shaft 33 is described as the reciprocating means and the drawings indicate a sufficient throw to give them a long reciprocation. The drawings are defective in that the guide slot is too short, but in the model, Defendant's Exhibit H, the slot limitation has been removed and the crank shaft is rotated around and around. If defendant's correction be justified, there is ample movement to reciprocate the rolls 30 over the entire sides of the core, and they are competent to perform the office ascribed to them in the specification.

There is no authority (Vol. I, p. 471, Q. 55) for the statement of defendant's expert that it is impossible for the tools of Fig. 6 "to act on the tread portion as they would simply be lifted off from their supports". On the contrary, the specification states that at the outset the tool of Fig. 6 "comes to the level of the top of the core" and that it descends progressively "all the way down to its base".

There is no authority (Vol. I, p. 472, Q. 56) for the mode of action attributed to the tool of Fig. 6 by defendant's expert, in his endeavor to obviate the difficulty last noted, that the operator brings the roll of Fig 6 "*about* to the level of the top of the core" and then starts the machine and by "the time he has assumed this working position" the rolls will have reached the proper level to begin action. The statement in the specification that the

roll starts at "the level of the top of the core" is of course a death blow to his theory that the roll operates only to apply the fabric from the median line, and therefore he is forced to suppose that there is an idle interval and that time must be wasted. The description is specific, not only that the roller starts at the top of the core, but also that it "is caused to descend progressively on the side of the core and all the way down to its base". One act is mentioned as immediately following the other and there is no suggestion of any idle interval. Referring further to this theory, there is no reference in the specification to the roll as spinning the fabric "smoothly into shape and simultaneously applying it to the cemented surface of the core." There is no mention whatever of any spinning function by the roll; no suggestion that it effects the shaping of the fabric; and no suggestion that it applies any portion of the fabric to the core. The only office attributed to the tool is the removal or effacement of pockers or wrinkles already in the fabric.

There is no authority (Vol. I, p. 474, Q. 57) for the statement of defendant's expert that the Belgian patent "has automatic feeding means making it in a real sense an automatic machine". As before pointed out, the tool carriage 17 does not constitute an automatic feed for the roll, but is merely a restraining guide to keep it from being fed too fast.

There is no authority (Vol. I, p. 476, Q. 61) for the statement of defendant's expert that the Goodyear machine is like that of the Belgian patent in that in both, after the original stretching, the tread portion is rolled into contact with the core. A tread roller is shown and described in the State patent and may or may not be used. Mathern's rolls 30 do not act upon the tread portion, but are described as acting upon the *sides* of the core.

There is no authority (Vol. I, p. 476, Q. 62) for the assumption of defendant's expert that the only things to be effaced are the "pockers" formed by the corrugating

gears 36, and that there are no wrinkles to be removed after the application of the fabric to the core. This is entirely inconsistent with the reference to the original stretching or lengthening, "which lengthening greatly facilitates the removal of the pockers". *If defendant's translation be correct*, when Mathern stretches the fabric to facilitate "the removal of the pockers", he is *simultaneously forming the pockers* in the edges of the fabric by the bevel gears 36! Of course, the stretching of the fabric has nothing to do with the subsequent removal of these particular pockers. Therefore, the "pockers" (obviously *wrinkles*), whose removal is facilitated by the stretching, must be those formed in the body of the fabric and which Mathern says are subsequently removed by starting the tool of Fig. 6 at "the top of the core". There is thus developed a palpable absurdity and it arises from incorrect translation. If the word "*déplissage*" at this point be translated *removal of the wrinkles* instead of "removal of the pockers", the sense is clear. Professor Spiers testified to the effect that the preferable translation is "unwrinkling" or the like, and in the *Firestone* case the passage was translated as "greatly facilitating the unwrinkling".

There is no authority (Vol. I, p. 478, Q. 63) for the assumption of defendant's expert that the tool of Fig. 6 is to be used in conjunction with a high speed core, in practically the same manner as State's rolls and core are employed. This is also apparent when the function of the corrugating gears 36 is considered, the specification describing their action as for the purpose of contracting or convexing the fabric. Defendant's position is absolutely untenable. The rotation of the Mathern core at high speed, if the fabric were not already cemented thereto, would throw the skirts out by centrifugal force away from the sides of the core in such way as to negative the convexing effect of the gears 36. *It would be wholly senseless to contract or convex the fabric to the approxi-*

mate shape of the core, and then immediately after destroy the shape which such pains had been taken to secure.

Subsequent history. As related (Vol. I, p. 479, Q. 64), the Belgian patent was abandoned and allowed to lapse because of the failure to pay the first annuity of twenty francs. This is confirmed in the official publication "Moniteur Belge" of August 9, 1908, in evidence as Plaintiff's Exhibit No. 14.

Mathern German patent. This German patent would be without anticipatory effect, even if there were similarity of mechanism, for the reason that it was not published until January, 1909, many months after State's development and the installation of his first commercial machine. The application was filed a few months after the Belgian application, and the patent is of interest only (Vol. I, p. 480, Qs. 65, 66) in that Mathern retained the corrugating gears 36 and the reciprocating rolls 30 of the Belgian patent, which defendant's expert says are practically useless, and discarded the tool of Fig. 6, which defendant's expert regards as of the first importance.

In place of the tool of Fig. 6, the German patent shows an oscillating sector or cradle 29, carrying a series of stepped rolls 38, which rolls move only in a concentric path and have no radial component whatever. Again, the core is described in the Belgian patent as making a number of rotations while the tool of Fig. 6 is acting; in the German patent the core makes but a single rotation during the operation of the substituted rolls 38.

Mathern commercial machine. The only evidence as to Mathern's commercial machine is given by defendant's witness, Duncan, who testifies (Vol. I, p. 196, Q. 15) that the Hood Company installed one in the latter

part of 1911, or more than three years after the first State commercial machine. He admits (Vol. I, p. 203, x-Q. 63) that it was not provided with the tool of Fig. 6 of the Belgian patent, but had (x-Q. 64) the means shown in the German patent at 29 in Fig. 1 of the drawings; and (x-Q. 65) that it had the pair of reciprocating rollers 30 shown both in the Belgian and German patents. Later on the Hood Company altered the construction in various particulars unessential to this case.

This particular machine was used as the foundation of the Mathern Belgian model introduced in evidence herein as Defendant's Exhibit H. In some respects it had the general structure shown in the Belgian patent, but numerous alterations had to be made. The principal change was the addition of the tool of Fig. 6,—*the first time that particular feature ever appeared in metal*, and even then not as disclosed in the Belgian patent but in a new and revised edition.

Court of Appeals for the Sixth Circuit on Mathern.

The Court of Appeals for the Sixth Circuit could not find anticipation in the Belgian patent but endeavored to use it in support of its aggregation theory. It says:

“* * * Still further,—it is conceded that the Belgian patent is a complete anticipation of State as to the matter of employing a radially-moving spinning roll in this type of tire-making machine for shaping the side of the tire,—unless plaintiff is right in his contention that in the Belgian patent the fabric was first partially attached to the side by a device resembling Seiberling and Stevens' jigger fingers, that this operation left wrinkles and puckers, and that the spinning roll was used to remove these wrinkles and perfect the attachment. We do not see that this alleged distinction is very important. No matter if the fabric has been already partially attached,—as much as is consistent with

any reasonable theory of operation,—the tool of the Belgian patent is a spinning roll, and performs a spinning operation; and, if we are right in what we subsequently say regarding the 'centrifugal force' theory, the Belgian tool in its radial progress was bound to stretch and reshape the fabric in substantially the same way that is done by State. Putting all these things together, State can not be considered as the inventor of the method; and hence there is no reason to hesitate at the result reached *because of aggregation.*"

As to which the following comments seem to be in order:

1. The first sentence sufficiently expresses the Court's unwillingness to accept the Mathern patent as full anticipation.
2. It has never been clearly understood what was meant by the expression, "it is conceded that the Belgian patent is a complete anticipation", etc. Plaintiff never conceded it in word or deed. If the language means that the Mathern *model* can be operated along the State mode of action and with State's results,—plaintiff is willing to concede this. But no such mode of action is disclosed in the Mathern patent, and the Courts have positively condemned such reproductions in the light of subsequent art. Moreover, in the earlier case the Mathern patent was submitted on affidavits. Here it is discussed in depositions.
3. "We do not see that this alleged distinction is very important. * * * the tool of the Belgian patent is a spinning roll". Considered merely from the dictionary standpoint, the statement is probably correct.* The roll does spin in the sense of rotating

* Standard Dictionary: "To whirl or turn round rapidly, as a top; also to rotate rapidly on an axis, as a pulley." Compare the language "they revolve at high speed" in State's specification, page 5, line 95.

or whirling, but there is no *forming* action like that of the State roll. It is submitted that something more than mere words should control and that the real test is *function*, and particularly when the part is a cooperating element in a specified combination. Moreover, as later pointed out, the disclaimer clears up all questions of verbal anticipation, as it ascribes the proper functions to the roll and cooperating core.

4. "if we are right in what we subsequently say regarding the 'centrifugal force' theory". This has already been discussed. What the Court refers to is its later statement,—"To make centrifugal force an effective basis of validity in the State patent would be to give a monopoly of the spinning process or of rapid core rotation; and each was old." *Neither was old.* There was no word or evidence in the earlier record to support such a finding, and there is positive evidence in the present record that the high speed referred to and its resultant centrifugal force were new. The only prior speeds definitely given are 30 R. P. M. for the Seiberling & Stevens machine (Vol. I, p. 307, Qs. 34, 35) and (Vol. I, p. 168, Q. 13) "from 50 to 60 revolutions per minute" for hand spinning. It is now established that the *minimum* speed at which centrifugal force becomes effective is somewhere between 80 R. P. M. and 120 R. P. M. If the Court of Appeals for the Sixth Circuit had had the present record, it would not have made the quoted statement.

5. The last sentence affirms the Court's general technical position that State's claims were void because of aggregation, and not because of anticipation.

**Court of Appeals for the Third Circuit on
Mathern.**

In the present case, the Court of Appeals for the Third Circuit disposed of the Belgian patent to Mathern, as follows:

"As we have said before, State's was the first successful machine in this country to make a double stretched automobile tire by machinery. It is contended, however, that what he did was anticipated by the Belgian Patent No. 194,731, granted September 20, 1906, to Alphonse Matherne, for a machine and process for mechanically manufacturing casings for pneumatic tires. Without entering into minute details, it suffices to say that by certain mechanism Matherne proposed to unwind the fabric which is advanced to the core, and to stick or plaster it to the tread circumference, or, as the patent states,

'As the fabric is pulled along and unwound from the drum 18 it encounters the rollers 30 on the casing 28 * * * each of these rods carries at its extremity a roller 30 which advances and retracts on the core, so as to stick to its straight or convex sides the fabric which has been placed there.'

"In addition to thus plastering the tread portion and thereby lengthening the fabric along the line of the median circumference of the core, the outer or free edges of the fabric were lessened in length by a process of crimping, which is described in the patent as follows:

"The fabric on leaving the drum passes between two rolls that are spherical or oval in form and arranged in such a manner as to produce a slight lengthening of the middle of the fabric, which lengthening greatly facilitates the removal of the pockers. On the same support there is mounted at each side, two conical gears 36, the sole purpose of which is to produce a slight, uniform puckering

of the fabric strips at their edges, ensuring in advance a uniform contraction of the fabric at all points.'

"Now it will be observed that at this stage, while there is lengthening of the median line of the fabric by circumferentially stretching, there is no contraction of the outer edges by radial stretching. It is true, the edge of the fabric has been crimped or puckered, but this puckering, while it has shortened the line by forming puckers, has not changed the square of the fabric into a radial diamond-shaped interstice, as is the case in State's machine. Moreover, this puckered edge or skirt was not left free as in State, but was plastered down by Matherne to the side of the core, in that regard the patent saying:

'The fabric is placed on the core, which is coated with a layer of rubber solution so that the fabric adheres well to it and may be pulled along by its rotary movement.'

"To smooth out the designedly formed puckers or wrinkles on the cemented edge of the fabric, Matherne provides a forked tool which has a rounded roller set at an angle on a sliding tool carrier. The operation is thus described:

'On the support 17, which constitutes a tool carrier, there is mounted a tool like that shown in Fig. 6, which has a fork with a rounded roller set at an angle. The sliding tool carrier 17 is adjusted so that the roller comes to the level of the top of the core. Then the machine is set in operation and the roller is caused to descend progressively on the side of the core and all the way down to its base. Thus there is obtained the complete and rapid removal from the fabric of the puckers, the descending motion being produced automatically by the pawl 34. Both sides may be readily worked at the same time, by mounting two tools like that shown in Fig. 6, on the sliding tool carrier 17.

* * * This last device (the tool of Fig. 6) has a great advantage in being manually controlled, whereby it has the capacity of easily passing over the beads.'

"We cannot accede to the contention that Matherne's disclosure had the effect of destroying State's practically operated and highly successful machine. There is no evidence that the machine in the form disclosed by Matherne had any effect on the art. In point of fact, he suffered the patent to lapse in default of the first payment required after its issue, and when he subsequently obtained a German patent he abandoned his rollers and adopted another form of mechanism. But wholly apart from these considerations, we feel that Matherne did not touch upon or solve the problem overcome by State. In the first place, he deliberately formed puckers and then sought to eliminate them, a procedure wholly different from State, who never formed puckers, and indeed prevented their formation by radial stretch and radial diamond pointed interstices. Matherne plastered his puckers to the core without stretch, and thereafter sought to roll out the puckers. State, on the other hand, left the skirts of his fabric free, and stretched those fabric edges into radial diamond-shaped interstices, by the use of high-speed core rotation. Indeed, the whole process of Matherne, so far as the side and inside or bead zone of the fabric was concerned, was simply the use of a hand roller to iron out the puckers he had deliberately formed and plastered on the core. Had the art stopped with Matherne's proposed machine, the auto tire art would not have had the impetus brought about by State's disclosure."

It is evident from the above quotation that the Court of Appeals for the Third Circuit saw clearly that the Mathern patent did not disclose the real invention of State involving the use of a high speed core functioning to throw out and extend the skirts of the fabric in an unwrinkled and puckerless condition, combined with spinning rolls forced to travel at regulated degrees in fixed radial guides and under the pre-regulated pressure of springs or weights, for applying the outflung free, unwrinkled and unpuckered skirts of the fabric to the

bead zone of the core, so as to result in a radial stretch of the meshes of the fabric at that point, as in both plaintiff's and defendant's machines.

Authorities on Anticipation.

In order to defeat a patent in suit, the alleged anticipation must be definite and positive, and nothing must be left to conjecture or uncertainty. The burden of proof in these respects is upon defendant, and every reasonable doubt must be resolved against it. The Mathern Belgian patent does not measure up to the requirements, and the other patents set up by defendant are of course even more remote. Authorities are so numerous that reference is made only to a few of the opinions of this Court:

Coffin v. Ogden, 18 Wall. 120:

"The invention or discovery relied upon as a defense, must have been complete, and capable of producing the result sought to be accomplished; and this must be shown by the defendant. The burden of proof rests upon him, and every reasonable doubt should be resolved against him. If the thing were embryotic or inchoate; if it rested in speculation or experiment; if the process pursued for its development had failed to reach the point of consummation, it cannot avail to defeat a patent founded upon a discovery or invention which was completed; while in the other case there was only progress, however near that progress may have approximated to the end in view. The law requires, not conjecture but certainty. If the question relate to a machine, as thus exhibited, the conception must have been clothed in substantial forms which demonstrate at once its practical efficacy and utility. *Reed v. Cutter*, 1 Story, 590."

Seymour v. Osborne, 11 Wall. 516:

"Mere vague and general representations will not support such a defense, as the knowledge supposed to be derived from the publication must be sufficient to enable those skilled in the art or science to understand the nature and operation of the invention, and to carry it into practical use."

Topliff v. Topliff, 145 U. S. 156:

"It is not sufficient to constitute an anticipation that the device relied upon might be made to accomplish the function performed by the patent in question, if it were not designed by its maker, nor adapted, nor actually used, for the performance of such functions."

Carnegie Steel Co. v. Cambria Iron Co., 185 U. S. 421:

"This defense presents the common instance of a patent which attracted no attention, and was commercially a failure, being set up as an anticipation of a subsequent patent which has proved a success, because there appears to be in the mechanism described a possibility of its having been, with some alterations, adaptable to the process thereafter discovered."

Cohn v. U. S. Corset Company, 93 U. S. 366:

"It must be admitted that, unless the earlier printed and published description does exhibit the later patented invention in such a full and intelligible manner as to enable persons skilled in the art to which the invention is related to comprehend it without assistance from the patent, or to make it, or repeat the process claimed, it is insufficient to invalidate the patent."

Bates v. Coe, 98 U. S. 31:

"Certain extracts from a printed publication were also introduced in evidence by the respondents for the same purpose, in respect to which it is only necessary to state that, in the judgment of the court, they

fall far short of what is required in such a controversy to constitute satisfactory proof that the invention had been described in a printed publication prior to the invention of the complainant."

Clough v. Gilbert & Barker, 106 U. S. 166:

"The structure was not designed for the same purpose as Clough's; no person looking at it or using it would understand that it was to be used in the way Clough's is used, and it is not shown to have been really used and operated in that way."

This Court has gone further and indicated that even when the *actual thing* was in existence *accidentally* or *incidentally*, it is no anticipation.

The leading case is *Tilghman v. Proctor*, 102 U. S. 707. Mr. Justice Bradley says:

"If the acids were accidentally and unwittingly produced, whilst the operators were in pursuit of other and different results, without exciting attention and without its even being known what was done or how it had been done, it would be absurd to say that this was an anticipation of Tilghman's discovery."

This doctrine has been reaffirmed in the recent case of *Eibel Process Co. v. Minnesota & Ontario Paper Co.*, wherein it is stated:

"In the first place we find no evidence that any pitch of the wire, used before Eibel, had brought about such a result as that sought by him, and in the second place if it had done so under unusual conditions, accidental results, not intended and not appreciated, do not constitute anticipation. *Tilghman v. Proctor*, 102 U. S. 707, 711; *Pittsburgh Reduction Company v. Cowles Electric Co.*, 55 Fed. Rep. 301, 307; *Andrews v. Carman*, 13 Blatchford, 307, 323."

Attention is again particularly directed to the cases previously quoted from to the effect that an early machine reconstructed and revised in the light of the later art cannot serve as an anticipation.

Doctrine of Potts vs. Creager. With especial reference to metal spinning, wherein "spinning" rolls are employed, the Courts have held that the adaptation of a device from another art constitutes invention, unless that other art is a closely analogous one. Of course, in metal spinning the mode of operation was totally different. There was nothing to parallel State's use of centrifugal force to hold the fabric out smooth and wrinkle-free away from the core. There was no hinging and folding effect, or any of the various other important steps which characterized State's action. The metal was simply pushed down over the mandrel in successive steps and after successive re-heatings. The only possible similarity is the verbal one involved in the term "spinning".

The leading case is *Potts v. Creager*, 155 U. S. 597:

"Indeed, it often requires as acute a perception of the relations between cause and effect, and as much of the peculiar intuitive genius which is a characteristic of great inventors, to grasp the idea that a device used in one art may be made available in another, as would be necessary to create the device *de novo* * * *. The apparent simplicity of a new device often leads an inexperienced person to think that it would have occurred to any one familiar with the subject; but the decisive answer is that with dozens and perhaps hundreds of others laboring in the same field, it had never occurred to any one before. The practiced eye of an ordinary mechanic may be safely trusted to see what ought to be apparent to every one."

This doctrine has been affirmed by this Court in other cases, such as *Hobbs vs. Beach*, 180 U. S. 390, and *DuBois v. Kirk*, 158 U. S. 58.

The Mathern abandonment. It has been frequently found that a patent for a commercial failure or an unsuccessful experiment does not anticipate. This doctrine has peculiar significance in connection with the proofs that Mathern immediately abandoned the tool of Fig. 6 on which defendant here relies. As this Court said in *Deering v. Winona*, 155 U. S. 302:

"Doubtless he did use a rigid extension of some sort; but if he ever used a pivoted device at all—of which we have considerable doubt—his efforts in that direction must be relegated to the class of unsuccessful and abandoned experiments, which, as we have repeatedly held, do not affect the validity of a subsequent patent."

See also:

Coffin v. Ogden, 18 Wall. 120;
Carnegie v. Cambria, 185 U. S. 421;
Whitely v. Swayne, 7 Wall. 685;
Smith v. Goodyear Vul. Co., 93 U. S. 486;
Brown v. Guild, 90 U. S. 23 Wall. 181;
Coupe v. Royer, 155 U. S. 565;
Gaylor v. Wilder, 10 Howard, 477;
Cimiotti v. American Co., 198 U. S. 400.

The lapse of the Belgian patent. Similarly, the lapse of foreign patents because of failure to pay subsequent annuities, as in the case of the Mathern patent, has been held an evidence of their worthlessness:

Carnegie Steel Co. v. Cambria Iron Co., 185 U. S. 403;
Streator Cathedral Glass Co. et al. v. Wire Glass Co. et al., 97 Fed. 950; 38 C. C. A. 573;
Cimiotti Unhairing Co. v. American Fur Co., C. C. N. J., 120 Fed. 672.

The differences in translation and expert interpretation. As already pointed out, defendant's translation of the Belgian specification differs in important particulars from that submitted in the earlier litigation, and has also been adversely criticized by Professor Spiers. In addition, the experts submit widely divergent views as to the Mathern disclosures,—a fact in part due to the uncertainty of translation. This creates a condition far removed from the certainty and positiveness required for anticipation. As the Court of Appeals for the Third Circuit said in *Goss v. Scott*, 110 Fed. 402:

"We may add, however, that in them only general language was used, and an intent announced by the patentee to occupy a general field. But such paper intent never materialized in plans or specifications. On the important element of form heading no light is thrown. Within the scope of the general language used, opposing experts have constructed widely different types of presses."

As stated in *Cimiotti v. Comstock*, 115 Fed. 524:

"A document so obscure in its terminology that two conflicting theories may be deduced therefrom and supported by equally plausible arguments is too indefinite to be utilized as an anticipation."

Or, as said in *Hillard v. Fisher*, 159 Fed. 439:

"Where they [the statements] are so vague, involved, intricate and contradictory that experts disagree radically as to their meaning and, following the instructions given, construct devices differing in fundamental features, it is safe to reject such a document as an anticipation."

See also:

Underwood vs. Elliott-Fisher, 165 Fed. 930;
Stead Lens Co. v. Kryptok Co., 214 Fed. 376.

**Invention May Reside in the Combination
of Old Elements, and Particularly When
They Co-operate With a New Mode of
Action.**

The general doctrine as to the combination of old elements has been enunciated in many cases. The two leading ones are opinions of this Court, to wit: *Loom Co. v. Higgins*, 105 U. S. 591, and *The Barbed Wire Patent*, 143 U. S. 283. A consideration of both is unnecessary, for the reason that in the latter this Court refers to and approves the former:

"There are many instances in the reported decisions of this Court where a monopoly has been sustained, in favor of the last of a series of inventors, all of whom were groping to attain a certain result, which only the last one of the number seemed able to grasp. Conspicuous among these is the case of *Webster Loom Company vs. Higgins*, 105 U. S. 580, 591, where an improvement in looms for weaving pile fabrics *consisting of such a new combination of known devices* as to give to a loom the capacity of weaving fifty yards of carpet a day, when before it could only weave forty, was held to be patentable. It was said by the Court, in answer to the argument that the combination was a mere aggregation of old and well known devices, that 'this argument would be sound if the combination claimed by Webster was an obvious one for attaining the advantages proposed —one which would occur to any mechanic skilled in the art. But it is plain from the evidence, and from the very fact that it was not sooner adopted and used, that it did not, for years, occur in this light to even the most skillful persons. It may have been under their very eyes, they may almost be said to have stumbled over it; but they certainly failed to see it, to estimate its value, and to bring it into notice * * *. Now that it has succeeded, it may seem very plain to any one that he could have done it as well. This is often the case with inventions of the greatest

merit. It may be laid down as a general rule, though perhaps, not an invariable one, that if a new combination and arrangement of known elements produce a new and beneficial result never attained before, it is evidence of invention."

Bates v. Coe, 98 U. S. 48;

Parks v. Booth, 102 U. S. 96;

Imhaeuser v. Buerk, 101 U. S. 647; affirming

Bates v. Coe.

Cantrell v. Wallick, 117 U. S. 689:

"The first defense is based on the theory that a patent cannot be valid unless it is new in all its elements as well as in the combination, if it is for a combination. But this theory cannot be maintained. If it were sound no patent for an improvement on a known contrivance or process could be valid. And yet the great majority of patents are for improvements in old and well-known devices, or on patented inventions. Changes in the construction of an old machine which increase its usefulness are patentable. *Seymour vs. Osborne*, 11 Wall. 516. So a new combination of known devices, whereby the effectiveness of a machine is increased, may be the subject of a patent. *Loom Co. vs. Higgins*, 105 U. S. 580; *Hailes vs. Van Wormer*, 20 Wall. 353," etc., etc.

New mode of operation. This general doctrine is particularly emphasized, when as in the patent in suit, the old elements co-operate with a new mode of action. Spinning-rolls were old. Ring-cores were old. But they had never been used before in the peculiar relations in which State employed them, wherein the core was rotated at a sufficiently high speed and sufficient centrifugal force was created to throw the fabric skirts out from its sides, while the roll in its radial movement acted upon the thrown-out skirts to stretch them radially and to shape and apply them to the sides of the core.

Especial stress is laid on this doctrine because of

defendant's insistent contention that *State is endeavoring to cover a method or "art"*. There is a vast difference between an "art" and a "machine" characterized by a new mode of operation.

The text books treat the principle as well established. *Walker*, § 37, p. 49, says that "an old combination with a new mode of operation may be an invention." *Hopkins*, p. 79, and *Robinson*, Vol. I, § 155, p. 219 *et seq.* (and cases cited) speak to the same effect.

A leading case is *Keystone vs. Adams*, 151 U. S. 139, wherein the Adams patent covered a corn sheller, against which two other patents were set up as anticipatory, one of them being to the patentee's father. In all three machines the combinations, considering the elements merely, were precisely the same. Among these elements in each machine there was a rotating shaft provided with wings. In the earlier machine, and to prevent the clogging of the throat of the sheller, the shaft was rotated rearwardly to hold the ears of corn back. But this arrangement retarded the operation of the shelling machine. Therefore, the patent in suit rotated the shaft in a forward direction and the difficulty was overcome. There could be no clearer case. From the standpoint of construction and of the devices employed therein, the combinations were precisely the same. All that the patent in suit did was to reverse the direction of the rotating shaft. In this way the mode of action was altered and the combination of old parts became a new combination. The opinion says:

"* * * While it is true that the device patented by Augustus Adams, the father of the present patentee, in May, 1866, was intended to effect the same purpose, and used likewise a revolving shaft with wings or protuberances, *yet the mode of operation was entirely different.*"

And at a later point:

"It must be admitted that both of these patents granted to Augustus Adams, one in 1861, and the

other in 1866, describe mechanical contrivances closely resembling the invention in question, patented by H. A. Adams, October 15, 1872. There is present in all three machines a rotating shaft with spurs or wings, and the purpose sought to be effected is the same.

But, as we have seen, when the test of practical success is applied, the conclusion is favorable to the last patent.

Where the patented invention consists of an improvement of machines previously existing, it is not always easy to point out what it is that distinguishes a new and successful machine from an old and ineffectual one. But when, in a class of machines so widely used as those in question, it is made to appear that at last, after repeated and futile attempts, a machine has been contrived which accomplishes the result desired, and when the Patent Office has granted a patent to the successful inventor, the courts should not be ready to adopt a narrow or astute construction, fatal to the grant."

The same holding has been made in many other cases, although nowhere is the principle more clearly expressed. An instance is:

Seymour v. Osborne, 78 U. S. 516:

"Particular changes may be made in the construction and operation of an old machine so as to adapt it to a new and valuable use not known before, and to which the old machine had not been, and could not be, applied without those changes and, under those circumstances, if the machine, as changed and modified, produces a new and useful result, it may be patented, and the patent will be upheld under existing laws. *Bray v. Hartshorn*, 1 Cliff. 541; *Losh v. Hague*, 1 Web. Pat. Cas. 207; *Hind Pat.* 95; *Phillips v. Page*, 24 How. 166 (65 U. S. XVI, 640); *Norm. Pat.* 25.

Such a change in an old machine may consist merely of a new and useful combination of the several parts of which the old machine is composed, or

it may consist of a material alteration or modification of one or more of the several devices which entered into its construction, and whether it be the one or the other, if the change of construction and operation actually adapts the machine to a new and valuable use not known before, and it actually produces a new and useful result, then a patent may be granted for the same, and it will be upheld as a patentable improvement. *Park v. Little*, 3 Wash. (C. C.) 196."

But there is need of referring to but one other case in this Court to show that the mode of operation or functioning of the elements of a combination claimed may properly have a modifying effect on the combination itself, without laying the claim open to the objection of being for a process or method.

This is the very recent case of *Eibel Process Co. v. Minnesota & Ontario Paper Co.*, decided by this Court February 19, 1923 (43 Sup. Ct. Rep., 322). The invention of Eibel was an improvement in Fourdrinier machines for paper making. The separate elements that went to make up the patented combination were old and, indeed, the combination of them was old, if the peculiar way in which they co-acted was ignored.

The Court found the gist of the invention to reside in the maintenance of the breast-roll end of the paper-making wire of the machine at a substantial elevation above the level, and the provision of means for regulating the speed of the machine so as to cause the wire to travel at substantially the same speed as that of the rapidly moving stock due to the elevation of such breast-roll end of the wire.

One of the claims in suit was as follows:

"2. A Fourdrinier machine having the breast-roll end of the paper-making wire maintained at a high elevation, whereby the stock is caused to travel by gravity faster than the normal speed of the wire for

a certain grade of stock, and having means for increasing the speed of the machine to cause the wire to travel at substantially the same rate of speed as the rapidly-moving stock, substantially as described."

Notwithstanding the recitation of the functions and mode of operation of the several elements claimed in combination, this claim was held to be for a *machine* and not for a method or process.

The difficulty of setting forth, in the form of a claim, the real invention of the patentee was doubtless appreciated by the Court, but, in view of what the Court found to be the novel advance in the art attributable to Eibel, no difficulty was encountered in interpreting the claim to cover that invention.

The case is so recent that further discussion of it, here, would be out of place.

In the light of the foregoing authorities, let us again consider the combination which State brought into the art, viz.

(a) a rapidly rotating core upon the periphery of which the strip of fabric is applied and circumferentially stretched and by the rotation of which the skirts of the fabric are violently thrown out by centrifugal force to render them puckerless, wrinkleless and taut,

(b) spinning rolls for acting upon the outflung skirts of the fabric at their attached or hinged portions,

(c) hinged supports for the spinning rolls,

(d) power pressure means applied to the spinning roll supports for keeping the spinning rolls to their work under preregulated pressure,

(e) a radially sliding carriage running on fixed guides, upon which carriage the spinning roll supports are mounted, for compelling the traverse of the spinning rolls invariably in right lines,

(f) and means (the screw feed) for positively and regularly advancing the spinning roll carriage in its fixed path of movement,

whereby the power-pressed spinning rolls are applied to the centrifugally outflung taut skirts of the fabric from the hinge portions toward the edges thereof in always advancing definite spiral lines of contact, resulting in the uniform radial stretching of the meshes of the skirts of the fabric and the close application of said skirts through the bead zone of the tire, without the puckering or wrinkling of the fabric at any point.

Not only is this an entirely new combination, but the elements cooperate with a new mode of action and produce a new result.

The Disclaimer.

Sections 4917 and 4922 of the Revised Statutes afford means whereby a patentee who has made his claims too broad may reduce them by disclaimer to correspond to the real scope of his invention. Plaintiff has taken advantage of these provisions to limit the claims of the patent in suit so that they will cover no more than what State actually invented, *i. e.*, the patent has been so narrowed that all extraneous matter has been eliminated and the claims confined to the particular combination previously defined.

The Courts have said that covering the matter in two distinct sections was not the best variety of statute writing and that they should have been combined in one clear and comprehensive statement. However, this defect has been remedied by construing them together. The leading authorities are *Hailes v. Stove Co.*, 123 U. S. 588, and *Sessions v. Romadka*, 145 U. S. 41. The resulting joint interpretation is well established and is given in the text books as well as in the cases. For instance, *Walker* (5th Edition, p. 264, § 193) states the purpose:

"Whenever through inadvertence, accident or mistake, and without any fraudulent or deceptive

intention, a patentee has, in his specification, claimed materially more than that of which he was the first inventor, his patent shall be valid for whatever is justly his own; and every such patentee, his executors, administrators, or assigns, whether of the whole or any sectional interest in the patent, may maintain a suit at law or in equity, for the infringement of such part, if it is a material and substantial part of the thing patented, and is definitely distinguishable from the parts claimed without right."

To secure this result, the proper disclaimer has been made, and it will be found at page 13, Vol. 2. It was filed February 14, 1919, after the bill of complaint herein. The practice of filing a disclaimer during the pendency of an action is entirely proper and has been approved many times by this Court:

Smith v. Nichols, 88 U. S. 112;
O'Reilly v. Morse, 15 How. 62;
Dunbar v. Myers, 94 U. S. 193;
Hailes v. Albany, 123 U. S. 582;
Carnegie v. Cambria, 185 U. S. 436;
Wilson v. Chicago, 105 U. S. 566.

One of the necessary requisites of such a disclaimer is that it shall be entered without unreasonable neglect or delay. That question does not arise here, as it was first prompted by the result of the litigation in the Sixth Circuit and was filed two months after the opinion of the Court of Appeals for the Sixth Circuit, in fact on the same day that the final decree was entered. Before that decree, there was no formal settlement as to the pertinence of the defenses relied on, such as the Matherne Belgian patent. We refer to the Matherne patent merely by way of convenient example and do not admit that it has significant bearing. It has been judicially held that there is no admission "that the subject of the disclaimer appears in the prior art, which may not by any means

be the case, nor is there any justification for so construing it." *Manhattan v. Helios*, 135 Fed. 785, 802. Defendant's repeated assertions to the contrary are without authority.

These conditions also dispose of defendant's contention that there is insufficient proof of "inadvertence, accident or mistake". Walker (p. 265, § 195) covers the topic rather completely:

"Mistakes of fact, relative to how much of a described process, machine or manufacture was first invented by its patentee, frequently follow from lack of full information touching what was previously invented by others. Litigation may alone disclose the fact that the patentee's claims are too numerous or too broad to be consistent with novelty. Whenever this occurs, it is clear that the patentee ought no longer to appear to hold an exclusive right to anything which he was not the first to invent. To this end, the statute provides that he must disclaim that part, within a reasonable time, or, in default thereof, must suffer the statutory consequences. On the other hand, it is equally clear, that if the patentee is willing to eliminate from his claims, everything which later information shows had been invented before him, he ought to be allowed to retain his exclusive right to the residue. To this end, the statute provides that if within a reasonable time, he disclaims what was another's, he shall be enabled to enforce his patent as far as it covers what was his own invention."

By way of anticipation, as the subject will be discussed later, there is of course a limit to a patentee's rights under these disclaimer statutes. While he is at liberty to cut and pare down his claims, he is not permitted to change the nature of the invention. The diminution must be quantitative rather than qualitative. He cannot alter the character of the claims by the introduction of different elements. He cannot import into the claims characteristics that are not warranted by the

specification. When alterations of this latter kind are to be made, they must be sought by reissue rather than by disclaimer, the leading authority being *Hailes v. Stove Co., infra*. However, the present disclaimer is quite free from attack in these particulars.

Terms of disclaimer. The disclaimer may be conveniently considered under three distinct heads,—*a.* Clauses "First", "Second" and "Third"; *b.* Clause "Fourth"; and *c.* Clause "Fifth". The two latter heads will be first disposed of.

Clause "Fourth". The Court of Appeals for the Sixth Circuit held that it was aggregation to claim the tread roll in combination with the spinning-rolls, etc. Whether or not this finding be correct, the disclaimer eliminates all claims embodying the tread-forming roll, namely, Nos. 8, 9, 10, 11 and 14, so that the tread roll disappears from the case. In addition, claims 15, 16 and 17, relating to subsidiary features not connected with the skirt-forming devices, such as the muslin take-up roll, were eliminated. The cancellation of entire claims in this manner has been approved by this Court.

O'Reilly v. Morse, 15 Howard, 62;

Sessions v. Romadka, 145 U. S. 41.

Defendant argues, but without proper basis, that the disclaimer of the claims Nos. 8, 9, 10, 11 and 14 has the effect of erasing other claims in suit, basing its theory on the allegation that these disclaimed claims are more limited than those retained and that the surrender of the narrower ones necessarily eliminates the broader ones. There is no ground for this contention. It has already been pointed out that each of the specified claims included the tread roll as an element. In other words, they were for a *totally different combination*. In fact, the Court of Appeals for the Sixth Circuit said that because

of the inclusion of the tread roll there was no combination at all, but rather aggregation. It was in part to meet this objection that the claims were taken out. There was no erasure of claims, whether of broader or narrower scope, embodying the principal combination retained. Defendant's premises give no support to its theory. In addition, it has been often held that each claim in a patent stands by itself and is in effect a patent by itself. Moreover, the two cases last cited above are ample authority for the disclaimer of individual claims which are void or objectionable for other reasons.

Clause "Fifth". On lines 72 to 80 of page 1 of the specification, it is stated that the combination of the tread roll and the spinning-rolls is "an important feature of my invention". In view of the cancellation of the tread roll claims, the quoted words have been also eliminated. On lines 92 to 96 of page 1, the muslin take-up roll is referred to "as another feature of my invention". Claim 15 related to the take-up roll and has been disclaimed. Therefore, the quoted language has also been eliminated. Numerous authorities hold that too broad statements in the specification may be cancelled by disclaimer.

Carnegie v. Cambria, 185 U. S. 436;

Hurlbut v. Schillinger, 130 U. S. 456;

Wilson v. Chicago, 105 U. S. 566.

Clauses "First", "Second" and "Third".

These three clauses constitute the really important part of the disclaimer in that they bring out State's real invention, and thus cut out matter which may have been embraced by too broad and comprehensive language; and also they dispose finally of "aggregation" as suggested by the Court of Appeals for the Sixth Circuit.

As the claims in suit are closely related, it is believed that the discussion of a single one will suffice, and for

that purpose we have selected No. 22 almost at random. After referring preliminarily to the "sheet-fabric supply", which indicates that sheet-fabric is acted upon, the combination sets forth,—

"a power-driven ring-core,

a radially moving support laterally power-pressed toward the core, and

a spinning-roll mounted on the support for passing radially along the sides of the tire-shoe to shape the sheeted fabric on the core".

In this connection, it is important to bear in mind the established legal principle, as to which authorities have been previously given,—that bringing together old elements with a new mode of action constitutes *a new combination* (*Eibel case, supra*).

In our examination of the selected claim, and referring to the language of clause "Third" of the disclaimer,

(a) It is first stated that the recited elements are "constructed and co-ordinated for shaping and applying a previously unshaped sheet fabric supply to that part of the recited ring-core beyond the tread portion". This is by way of preface, and merely gives the purpose as set forth in the specification. The individual elements are next taken up.

(b) It is then stated that "the power-drive for the ring-core functions by a sufficiently high speed of rotation and consequent centrifugal force to throw the unapplied fabric portion out from the side of the ring-core". In the claim as it originally stood, there was no direct reference to the speed, and this is now stated, thus ascribing the proper co-operative action to the core.

(c) And it is finally stated that the spinning-roll "in its radial movement and while pressed toward the ring-core, functions by a gradual action upon such centrif-

ugally thrown-out fabric, to shape it to the side of the rotating ring-core while bringing it into adhesive contact therewith". In the claim as it originally stood, while the spinning-roll is said "to shape the sheeted fabric on the core", there was no reference to its action upon the "centrifugally thrown-out fabric". This is now stated, thus ascribing the proper co-operative action to the roll.

Let us compare this more completely stated organization with that disclosed in the Mathern patent, selected as an example of the prior art, although it is again noted that the disclaimer does not admit its pertinence (*Manhattan vs. Helios, supra*). For instance, in the Mathern patent the roll is not "power-pressed" but held manually against the core; and it does not "shape the sheeted fabric on the core"; and in addition the support is of a different nature in that instead of effecting the advance of the roll, it really restrains it. However, ignoring differences like these, Mathern did have a power driven ring-core of uncertain speed, some kind of a movable support, and what the Court of Appeals christened "a spinning-roll". State has three elements which are called by the same names, and there the resemblance begins and ends, since the Court "is not to judge about similarities or differences *by the names of things*" (*Machine Co. v. Murphy*, 97 U. S. 120). The parts co-operate in a totally different fashion and the disclaimer sets forth the mode of action.

If the original references merely to a core, and merely to a roll to pass radially along its sides, were too broad and comprehensive, in that they did not specifically differentiate from cores *per se* and rolls *per se* in the prior art, the objection has certainly been removed by the disclaimer, which has the combined effect of limiting the claim to its proper scope, of distinctly specifying the new mode of action which characterizes the State invention and of disposing of the theory of "aggregation".

And, as already pointed out, there is ample support in the specification for the functions ascribed by the disclaimer to the core and roll. This is practically admitted by defendant. There is the reference to a speed of 207 R. P. M., which is quite adequate to produce the centrifugal effect. There is the statement that "the centrifugal force tends to throw the fabric out at a right angle from the core plane", and it is so shown in Fig. 12^b. It is said that the rolls "by radial motion with respect to the ring-core gradually press the canvas in contact with the sides of the ring-core toward its internal periphery to shape the sides of the tire" and that they "have been found particularly efficient in shaping the sides of the tire shoe and form an important feature of my invention." And there is much more of similar significance that need not be repeated. Even though the complete scientific explanation be not given, there is a full description of the mechanism; and that is all the law requires under the authorities previously noted. No new element has been added. The recited elements remain unchanged. There is merely a statement of their co-operative relations and of the new mode of action. This is well within the practice permissible under the Statutes. The Court of Appeals for the Sixth Circuit must have found differently, if it had been dealing with the present state of facts.

Instances of proper disclaimer. The Courts have always been liberal in approving disclaimers designed to reduce the scope of claims, provided that no new elements are introduced, that the intrinsic nature of the invention be not altered, and that there be a proper basis in the specification. Some of these cases will now be examined.

Silsby v. Foote, 14 How. 218:

This is a well known authority and has been often cited. Its particular interest resides in the fact that the disclaimer diminished the scope of the claims *by stating the mode of action* of the elements therein without other change. The invention related to a stove provided with a damper and also with a metallic rod which by thermostatic action opened and closed the damper. The claim was too broad, the significant portion being as follows:

"the application of the expansive and contracting power of a metallic rod, by different degrees of heat, to open and close a damper which governs the admission of air into a stove."

The italicized language was too general, and the claim was met verbally by the prior art, wherein it was old to govern the dampers of stoves and furnaces by thermostats subjected to the heat of a room. The real invention involved the location of the thermostatic rod in the stove itself, and so the scope of the claim was cut down by a disclaimer which stated that "such rod shall be acted upon directly by the heat of the stove or the fire which it contains." In other words, the old elements remained the same, but the combination was restricted *by a statement of their cooperative relations and of their new mode of action*. The State disclaimer is in the same category.

Permutit Co. v. Harvey Co., 279 Fed. 713, 721 (2nd C. C. A.):

This is another and very recent instance of a claim being saved by a disclaimer setting forth a new mode of action of old elements. The invention related to water-softening or filtering apparatus, and it was discovered that a similar arrangement of the same parts had been previously used for the same purpose. Thereupon, a disclaimer was filed which limited the claim to the *downward* passage of the water to be softened,—in other words,

reversing the flow as compared with that in the older apparatus. Speaking of the disclaimer, the Court said:

"It was intended by this to exclude from the scope of claim 1 the apparatus in which the water to be softened passes upwardly through the layer of zeolite. By this nothing was injected into the patent as argued by the appellants. This action was taken for the purpose of limiting its effect. The power to disclaim is a beneficial one, and should not be denied, except where a fraudulent and deceptive purpose is apparent. *Sessions v. Romadka*, 145 U. S. 29, 12 Sup. Ct. 799, 36 L. Ed. 609. We find no evidence of such purpose here."

An analysis of the opinion will indicate close parallelism to the facts at bar.

Butte v. Minerals Separation, 250 Fed. 241, 249; *Minerals Separation v. Butte*, 250 U. S. 336.

There was much litigation in this matter, but the two cases noted, respectively, before the Court of Appeals for the Ninth Circuit and this Court, are sufficient for our purposes. The patent related to improvements in the concentration of ores, the object being to separate the metalliferous material from gangue by the use of oils and the like. This was broadly old, but the patentee discovered that very much better results could be secured by using the oil in much reduced quantity. This Court had previously held claims 9, 10 and 11 invalid since they merely prescribed a "small quantity of oil", which the Court regarded as "a wholly indefinite quantity". Therefore, in order to bring out the real invention, a disclaimer was filed limiting the amount "to a fraction of 1 per cent. on the ore". The use of a small quantity like this was the real discovery, and in addition it differentiated from the prior art wherein more than one per cent. had been employed. Moreover, the Court held that a delay of three

and one-half months in filing the disclaimer was not excessive. The other and subsequent findings on the questions of infringement, etc., do not affect the situation. All we are concerned with is the nature of the disclaimer. The Courts held that a statement of the reduced amount of oil was sufficient. The State disclaimer indicates an increased core speed to obtain the requisite centrifugal force.

There have been numerous instances where limiting disclaimers of various kinds have been approved. To avoid undue prolixity some of them will be referred to in condensed form:

Thompson v. Bushnell, 96 Fed. 238:

The patent was for an improvement in sawteeth and was broadly claimed in connection with "a saw". Such teeth had previously been employed in connection with circular saws and hack saws. The disclaimer limiting the invention to hack saws and band saws was sustained.

Terry Co. v. New Haven Co., 17 O. G. 909:

The patent related to clocks and the claim covered a combined dead-beat and recoil escapement. This was broadly old and the claim was invalidated. Subsequently there was a disclaimer limiting the claim to such an escapement when "produced from flattened metal by bending". The claim was then sustained and held infringed.

Lockwood v. Hooper, 24 Fed. 910:

The claim was for "a rubber eraser having soft finished erasive surfaces". This was old broadly, but it was new to produce such a surface "by tumbling the eraser". The disclaimer was held good.

Roemer v. Neumann, 26 Fed. 102:

The patent related to a lock and the claim was invalidated. Certain notches were an important feature, and by disclaimer they were read into the claim. The disclaimer was held proper. The last statement is based on information contained in *Electrical Co. v. Julien*, 38 Fed. 117, see page 136.

Libby v. Mt. Washington, 26 Fed. 757:

The claim was for a method of making glass articles of different colors and was old broadly considered. The patentee was allowed to limit it by disclaimer to the use of the described gold-ruby compound.

Electrical Accumulator v. Julien, 38 Fed. 117:

The invention was a most important one and related to a storage battery, wherein the claimed electrode consisted of a support coated with "an active layer of an absorptive substance". This was broadly old, but it was new to apply the absorptive substance "in the form of a paint, paste, or cement", and in order to save the valuable patent, the Court itself suggested the disclaimer. The opinion contains an interesting discussion of the authorities and practice.

Page v. Dow-Jones, 200 Fed. 72:

The patent was for a printing telegraph machine, but the claim was too broad in that it related to a "constantly acting source of power". The disclaimer changed this to "constantly rotating drive shaft", and the claim was held valid and infringed. In this opinion also there is an enlightening discussion of the general subject.

Marconi v. DeForest, 243 Fed. 56:

The patent covered a detector used in wireless telegraphy, and after filing its bill, the plaintiff entered the following disclaimer:

"To the combination of elements set forth in claim 1 * * * *except as* the same are used in connection with high-frequency alternating electric currents or electric oscillations of the order employed in Hertzian wave transmission."

Certain words in the specification referring to low frequency currents were also disclaimed. The disclaimer was upheld and numerous cases cited in support of the ruling.

Aiken v. Dolan, 3 Fisher, 197:

The mechanism involved was a knitting machine, and the claim covered "a latch or tongue applied to the hook of the needle", which was not new in itself. But it was suggested by the Court that a disclaimer could be filed limiting the claim to latch needles with a certain curvature.

Tuck v. Bramhall, 6 Blatch. 95:

The claim was for a canvas piston packing in the form of a roll having a rubber core, *or without it*. This made the claim too broad, but a disclaimer limiting the claim to the forming of the roll *with the core* was held good.

Taylor v. Archer, 8 Blatch. 315:

The claim was for "the use and application of glue, or glue composition", in the manufacture of flexible tubing. It was old to use glue for the purpose, and the Court approved a disclaimer eliminating glue and limiting the claim to "glue composition".

There are numerous analogous cases wherein the scope of too broad a claim has been limited by the cancellation of statements in the description. Among them are:

Hurlbut v. Schillinger, 130 U. S. 456;
Carnegie v. Cambria, 185 U. S. 403;
Simplex v. Pressed Steel, 189 Fed. 70.

There are some cases wherein patents have been invalidated after disclaimer for reasons not relating to the propriety of the disclaimer itself. Among these are:

Smith v. Nichols, 88 U. S. 112;
Dunbar v. Meyers, 94 U. S. 193;
Wilson v. Chicago, 105 U. S. 566;
Brunswick v. Klump, 131 Fed. 255;
Bracewell v. Passaic, 107 Fed. 467.

Defendant's position. The principal defense as to the disclaimer is given in paragraph XXVI of the answer, viz., that the changes should "have been made by way of reissue", and that it was "unreasonably delayed". The latter has already been disposed of.

The *reissue* contention applies *only when the nature of the invention* rather than the scope of the claim has been altered, as by the attempted introduction into it of new elements, or where the statements in the disclaimer are not supported by the description in the specification. Neither of these conditions exists here.

Hailes v. Stove Co., 123 U. S. 582, is the leading case. The Hailes patent was for a stove, and the original claim in question was as follows:

"1st. Arranging a perforated firepot with a grate bottom within a circular stove having provision for the admission of air below the point of suspension of said firepot, substantially as described."

The Court held it anticipated and invalid. Thereupon, an effort was made to introduce in place of it a totally

new claim covering a different invention, and this was attempted under the guise of a disclaimer, which said in part as follows:

"the material or substantial part of the thing patented in and by said claim *not hereby disclaimed* being as follows:

'A firepot suspended from its upper edge with substantially the upper half of its sides made solid, and substantially the lower half of its sides containing perforations or openings.'

The Court held that there was no support for the new claim in the specification:

"* * * There is no word, or hint, in the patent, that the invention claimed was a firepot with sides grated only half way, or part of the way from the bottom towards the top, or that such partially grated sides have any advantage over those grated all the way to the top. The first claim, as modified by the disclaimer, has nothing in the specification to stand upon, nothing to explain it, nothing to furnish a reason for it."

The opinion further points out that where an amended or supplemental description is necessary to make the altered claim intelligible, the relief must be sought by reissue:

"* * * A disclaimer is usually and properly employed for the surrender of a separate claim in a patent, or some other distinct and separate matter, which can be excised without mutilating or changing what is left standing. Perhaps it may be used to limit a claim to a particular class of objects, or even to change the form of a claim which is too broad in its terms; but certainly it cannot be used to change the character of the invention. And if it requires an amended specification or supplemental description to make an altered claim intelligible or relevant, whilst it may possibly present a case for a surrender and reissue, it is clearly not adapted to a disclaimer."

Surely no such objections as these can be urged against the State disclaimer. The elements remain unaltered, and there is ample support in the specification for the new mode of action attributed to them. All that has been done was "to change the form of a claim which is too broad in its terms", as stated by the Court.

Electrical Accumulator v. Julien, 38 Fed. 117, 136, in its general discussion of the cases refers to *Hailes v. Stove Co.* as follows:

"* * * In that case there was nothing in the specification to indicate to the public that the invention of the patentee was what he sought to make it by the disclaimer. He claimed 'a perforated fire-pot', etc., and when he found that this was old he sought by disclaimer to limit his invention to a particular kind of fire-pot, described for the first time in the disclaimer."

Grant v. Walter, 148 U. S. 547, 557, gives another illustration of what this Court had in mind:

"* * * So that, under the operation of the disclaimer, the specification and claims would have to be read as addressed to the dyer rather than to the skein-maker. This would involve a complete change of what was covered by the specification and claims, which must be held controlling."

National v. Stetcher, 81 Fed. 395, 399. The disclaimer was not technically in the case, although the opinion discusses it in the following language:

"* * * An examination of the proposed disclaimer will, we think, disclose that a strong argument could be made in favor of the proposition that with the exception of the requirement that the channel should be recessed out of 'firm' paper or other material, the limitations or the requirements of the disclaimer point to an invention which would require an amended specification or a supplemental description."

It cites *Hailes v. Stove Co.*

Albany v. Worthington, 79 Fed. 966, 969, is an illustration of an attempt to introduce a new element by disclaimer. Complainant disclaimed "any apparatus, as included in the claims of said patent, which is not directly connected with the return pipe, H", etc., as to which the opinion says:

"* * * The difficulty with this contention is that it substitutes a different invention from that described and claimed in the patent. It is not a narrower claim, but a different one. It is, as defendants suggest, 'an attempt to incorporate into a claim for a combination a feature which had not been claimed in connection with that combination before, and thereby make a new combination.' "

Strause v. Crane, 235 Fed. 126, 129, also is an instance of the attempted introduction of a new element into the claims. The opinion says:

"* * * Nothing whatever was said in either claim about the air outlet passages;"

and at another point:

"* * * To introduce that element into the claims was therefore to provide a differentiation not suggested anywhere, unless it be in the figures themselves;"

and again:

"* * * We do think, however, that the differentiation afterwards incorporated into the claims must appear somewhere in either figures or specifications, and that unless it does the disclaimer becomes no more than a making over of the whole patent."

There are no new elements introduced by the State disclaimer, nor is there any statement therein not having full support in the specification. Its only effect is to narrow the scope of the claim. Reissue was not neces-

sary; disclaimer was the proper remedy along the lines of the authorities first cited.

Permutit Co. v. Harvey Co., 274 Fed. 937, already referred to as supporting a disclaimer based upon the specification of a different mode of action, is pertinent here also:

"The limitations imposed by the disclaimer have not altered the description as originally filed by the patentee or in any way changed the claim, except to narrow its scope. The Supreme Court in the case cited above also said that the power to disclaim is a beneficial one, and should not be denied to an inventor, except where the power is used for a fraudulent or deceptive purpose. Such I find was not the purpose in filing the disclaimer herein."

Court of Appeals for the Third Circuit on the Disclaimer.

Regarding the matter of the disclaimer, the Circuit Court of Appeals for the Third Circuit, in the present case, had this to say:

"Seeing, then, that State's contribution to the tire-making machine art was novel and useful, that it passed into general use and that its worth and the validity of his patent have been acquiesced in by large numbers of manufacturers in the automobile industry, who naturally would not pay tribute unless they were satisfied of the validity of his patent, we turn to the question whether such a meritorious patent is to be invalidated as held by the Court below, on account of the disclaimer State filed after the decision in the Sixth Circuit. We cannot give the disclaimer that effect.

"Experience has shown that very often applicants for patents, impressed by the seeming importance of their own inventions, have made statements and claims which time and closer knowledge of the art show are unwarranted. In relief of such common

mistakes, the disclaimer statutes allow a patentee to seasonably avow such unwarranted statements and unjustified claims, and to restrict and narrow his application to the limits of the real, novel, disclosure he made, and to confine his claims to that limit. Where a disclaimer is filed in good faith, and no attempt is made thereby to broaden or make more inclusive the original disclosure or claims, the law looks with favor on such procedure. In this case, there is no element of fraud, bad faith or an attempt to broaden the disclosure or claims, but an honest effort to eliminate from the specification and the construction of the claims all elements save those which constituted the true disclosure State gave the art.

"Broadly speaking, the essence of State's invention consisted of the combination of a power-driven core, with spinning rolls mounted on a radial, moving support, the rolls being so laterally spring-pressed as to compel them to follow the lessening contour of the shoe down to the bead edge."

* * * * *

"As to the claims which are here in suit and which embody the essential elements of State's disclosure, there was no abandonment of them but simply an assertion of and emphasis upon those vital elements which we have indicated. For example, take claim 22, which embodies the elements of, first, a power-driven ring core; second, a radially moving support laterally power-pressed toward the core; and third, a spinning roll mounted on a support for passing radially along the sides of the tire-shoe, to shape the sheet of fabric on the core. The effect of the disclaimer is to restrict the operation of these elements to that part of the ring core beyond the tread portion. In that respect, the disclaimer states that in respect to Claim 22:

"I hereby disclaim any combination of the recited elements *except when* constructed and co-ordinated for shaping and applying a previously unshaped sheet fabric strip to that part of the recited ring-core beyond the tread portion, *and unless* the power-drive for the ring-core functions by a sufficiently high speed of rotation and consequent

centrifugal force to throw the unapplied fabric portion out from the side of the ring-core, while the recited spinning roll in its radial movement and while pressed toward the ring-core, functions by a gradual action upon such centrifugally thrown-out fabric to shape it to the side of the rotating ring-core while bringing it into adhesive contact therewith."

In the *Eibel* case, had Eibel drawn his second claim, hereinbefore quoted, with bare elements stated and functions and mode of operation omitted, so as to read:

"2. A Fourdrinier machine having the breast-roll end of the paper-making wire maintained at a high elevation * * * and having means for increasing the speed of the machine * * *, substantially as described."

We make no doubt that this Court would have looked favorably upon a disclaimer which qualified the first element of the claim as applying *only when* "the stock is caused to travel by gravity faster than the normal speed of the wire for a certain grade of stock", and which qualified the second element of the claim as applying *only when* acting "to cause the wire to travel at substantially the same rate of speed as the rapidly-moving stock", in view of what this Court found to be the real invention of Eibel.

State's disclaimer should, we submit, be, in this case, regarded with equal liberality and favor.

The decree below should be affirmed.

Respectfully submitted,

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January 10, 1924.